

Journal
of the
Royal Society of Western Australia

Volume 49

Part 4

13.—The genus *Hednota* Meyrick (Lepidoptera; Pyralidae, Crambinae) in the south-west of Western Australia, with particular reference to economic webworm species

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Manuscript received 22 June, 1965; accepted 17 August, 1965

Abstract

Four species of *Hednota* are recognized as pests causing severe damage to crops of wheat, barley and rye, and introduced pasture grasses in Western Australia. The larvae of these species, *H. panteucha* (Meyrick), *H. longipalpella* (Meyrick), *H. pedionoma* (Meyrick), *H. crypsichroa* Lower, are collectively known as webworm and cause the damage by eating the young plants during winter.

Sixteen additional species of *Hednota* are known from the south-west of Western Australia. The taxonomy of all the adults, and of the immature stages of the four economically important species is presented.

Included are designations of lectotypes of Meyrick's species, *Eromene longipalpella*, *Thinasotia pedionoma* and *Crambus hoplitellus*, and Lower's *Hednota crypsichroa* and Walker's *Crambus relatalis*, together with the descriptions of five new species, *H. ancylosticha*, *H. koojanensis*, *H. tenuilineata*, *H. odontoides* and *H. empheres*.

Introduction

The term "webworm" has been previously used in Western Australia for larvae referred to as many as six species in five genera in the family Pyralidae (Lepidoptera). These larvae gained their common name from their habit of using silken webbing to line their burrows in the soil and to construct tubes among their food-plants. They make large bare patches among certain cereal crops and introduced-grass pastures (Fig. 1) by feeding on the fresh blades of the young plants from late autumn until early spring.

Webworm was first recorded as a pest by Newman (1921). Since then, in Western Australia, these larvae have reached the stage where they rank with the most important economic insects, having become the most serious insect pest of cereal crops. In recent years, e.g. 1962, severe damage has also occurred in South Australia.

Greatest concern has been aroused by the damage to wheat, *Triticum aestivum* L., but crops of barley, *Hordeum vulgare* L., and rye, *Secale cereale* L., have also been attacked. Crops of oats, *Avena sativa* L., have been left undamaged. Of the introduced grasses, barley grass, *Hordeum* spp., has been the favourite

host; and silver grass, *Vulpia* spp., and brome grass, *Bromus* spp., have been included in the diet (Wallace and Mahon 1952).

Four species of the pyralid subfamily Crambinae have now been positively associated with the damage. Bleszynski and Collins (1962) have catalogued these species within two genera, *Surattha* and *Hednota*. In the present paper, I refer all four species to *Hednota*. Members of *Hednota* occur mainly in Australia, and most of them are found in the more temperate portions of the continent.

The term "webworm" is well established throughout the farming community of Western Australia and therefore needs clear definition. I recommend its restriction to the Crambinae which cause the economic damage; and I here use the term collectively for the four *Hednota* species.

The results of the present taxonomic paper were obtained during concurrent investigations by me into the biology and ecology of webworm in Western Australia. (Details of my findings on biology and ecology have not yet been published.) I began this project on webworm in 1960 at the Western Australian Department of Agriculture and continued it at the University of Western Australia and the Western Australian Museum.

A brief outline of the seasonal cycle of webworm in the south-west of Western Australia is as follows. Only one generation is completed each year. The moths fly and lay eggs in autumn, mostly in April. The larvae feed from within individual vertical tubes and burrows. Between August and early October the final instar larvae deepen their burrows in the soil and remain in them until about March the next year. Then they pupate within the burrows; and, a few weeks later, the moths emerge.

One of the species, *H. panteucha* (Meyrick), was found to be the predominant species over a large part of the area of webworm distribution in Western Australia, and the biological and ecological studies were performed mainly on this species.

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This paper deals with the adults of the species of *Hednota* found in the south-west of Western Australia, and includes findings on the immature stages of the four webworm species. Following a request by Mr. P. E. S. Whalley, I herein designate lectotypes for four of the species represented by syntypes, which were only at the British Museum (Natural History). And I designate one lectotype in the South Australian Museum. During the investigation, five new species were discovered in Western Australia, and I describe them in this paper. (As far as I know, only one of these new species occurs outside Western Australia.)

The identity of webworm has gradually emerged since Newman (1921) first recognized the pest; and because there has been no complete review of the literature and the nomenclatural history of webworm, I find it necessary to present such a treatment in this paper before proceeding to the taxonomy of the adults of *Hednota*.



Figure 1.—Severe damage (dark areas on the ground) by webworm to pasture at Katanning, W.A., in 1949.

Materials and methods

I collected webworm adults from a light trap set at Koojan (near Moora), and the C.S.I.R.O. has provided me with the Crambinae collected in light traps at Nedlands (in Perth) and Glen Lossie Field Station at Kojonup.

I have examined the relevant adult specimens sent to me from all Australian institutions (except those in Tasmania) known to have Crambinae. Examined specimens of the four webworm species collected from all parts of Australia are listed. These lists are long and summaries are provided to assist the reader readily to see the distribution. In these summaries of distribution are included the additional localities, from the literature and from the label data of British Museum (Natural History) specimens, which are given by me in more detail under comments. Of the other *Hednota* species which occur in the south-west of Western Australia, only specimens caught there are listed.

Label data of the specimens examined are given in abbreviated form for each species. The following abbreviations are used:—

Collections: Australian National Insect Collection, Canberra, ANIC; Queensland Museum, QM; Australian Museum, New

South Wales, AM; National Museum of Victoria, NM; South Australian Museum, SAM; Western Australian Museum, WAM; Queensland Department of Agriculture and Stock, QDAS; Victorian Department of Agriculture, VDA; South Australian Department of Agriculture, SADA; Western Australian Department of Agriculture, WADA; Waite Agricultural Research Institute, South Australia, SAW; C.S.I.R.O. Western Australian Regional Laboratory, WAC.

Collectors: W. B. Barnard, WBB; J. D. Beresford, JDB; G. F. Berthoud, GFB; R. W. Bolt, RWB; J. A. Button, JAB; I. F. B. Common, IFBC; A. M. Douglas, AMD; P. N. Forte, PNF; C. F. H. Jenkins, CFHJ; L. Jenkins, LJ; L. E. Koch, LEK; P. J. Lawrence, P JL; J. A. Mahon, JAM; G. S. McCutcheon, GSMC; L. J. Newman, LJN; R. J. Priest, RJP; A. L. Rogers, ALR; D. G. Shedley, DGS; A. Sproul, AS; M. S. Upton, MSU; M. M. H. Wallace, MMHW.

Material collected prior to 1961 was lodged in the insect collection of the Department of Agriculture of Western Australia. Since then all my material (consisting of thousands of adults from all the mentioned light traps, the immature stages and the microscope slides which were prepared) has been lodged in the Western Australian Museum. Only a representative sample of the pinned material from this Museum is listed with the examined specimens.

I have unfortunately been unable to examine type specimens in the British Museum (Natural History). But I have obtained, in personal communications from Mr. P. E. S. Whalley, and include in this paper the following kinds of information on relevant specimens, which have been sorted by Dr. S. Bleszynski, in that institution: a list of specimens ("label data exactly as written") of the four webworm species; label data of type specimens; and comments on the comparison (by Whalley) of my microscope slides of genitalia of some of the species with genitalia slides of some of their specimens.

I include in this paper, drawings and descriptions of the genitalia of the four webworm species (this will enable the identification even of badly rubbed specimens of economic importance). And because of the close similarity of *H. ancylosticha*, sp. nov., *H. koojanensis*, sp. nov., and *H. empheres*, sp. nov., to *H. longipalpella* (Meyrick), *H. peripeuces* (Turner) and *H. relatalis* (Walker) respectively, I also here treat the genitalia of these. (At this stage I am unable to publish a taxonomic treatment at the generic level of all the species listed in the genus *Hednota* by Bleszynski and Collins (1962)).

The diagnostic drawings were made free-hand on squared paper while viewing through a squared graticule in the microscope. The uncus and gnathos of the male genitalia are shown in both ventral and lateral views to assist identification.

Unlike the plain antennae of the females, antennae of the males are pectinate or bipectinate; and characters of male antennae are included in the diagnoses where helpful.

The markings on the forewings serve as outstanding characters for identification, and they are detailed in the diagnosis of each species.

Discussion of the literature and the nomenclatural history of webworm

Newman (1921) incorrectly attributed webworm damage to one species of *Crambus* (Crambinae). Then he (Newman 1927) misidentified webworm as *Sclerobia tritalis* (Walker) (Phycitinae); and in this general paper, he confused the damage caused by webworm and *Sclerobia tritalis* (misspelling it as *tritialis*). He combined some observations on the biology of *S. tritalis* with those on webworm. His illustrations were of *S. tritalis*. [This species was described as *Hypochalcia tritalis* by Walker (1863). Turner (1904) regarded *Eucarphia vulgatella* Meyrick, 1879, as a synonym of *Hypochalcia* which he misspelled (*Hypochalchia*) *tritalis* and placed them both in the genus *Sclerobia* as *S. tritalis*.] Later, Newman (1932) further discussed webworm damage, but still called the species responsible *S. tritalis* [sic] and again illustrated this species.

Wallace and Mahon (1952) discussed damage by webworm, which they tentatively called the pasture webworm, *Talis pedionoma* (Crambinae). Following the example of the above papers, Gay (1955) in a list of common names, called *S. tritalis* the webworm and *T. pedionoma* the pasture webworm. Jenkins and Forte (1952) and Jenkins (1958) said that either more than one species of insect is covered by the term "webworm" or the true webworm is "*Talis pedionoma* Mayr." [sic]. Turner (1904) had stated that the Crambinae are probably the best known subfamily of the Australian Pyralidae, and that this region is remarkable for the very few species of the large cosmopolitan genus *Crambus* and for the large development of *Talis* which appears to take its place. Over forty Australian species were included by Turner in *Talis*, of which he regarded *Hednota* as a synonym.

In Western Australia during 1949 and 1950, moths attracted in numbers to lights during autumn, in areas damaged by webworm in the previous winter, were found to be predominantly *Hednota* spp. At that time, these were regarded as *Talis* spp. according to the generic classification of Turner (1904). And insect light traps set from 1951 yielded large numbers of four species identified as *Talis panteucha* (Meyrick, 1885), *T. longipalpella* (Meyrick, 1879), *T. pedionoma* (Meyrick, 1885), and *T. crypsichroa* Lower, 1893 by Mr. I. F. B. Common, Division of Entomology, C.S.I.R.O., Canberra, on the basis of material collected chiefly at Goomalling and Toodyay and sent to him by the Department of Agriculture of Western Australia in 1951. This was the first record of *panteucha* from Western Australia; the other three species had been taken previously in the State. From 1959, I have bred adults of these four species from larvae taken from various infested places at Moora and other localities. These are the only four species in the genus which have so far been bred from larvae found among the introduced grasses and cereal crops. At the same time, light trapping

has been increased and catches among the cereal crops and introduced grass pastures have contained small numbers of a few additional species of Crambinae; but there is no evidence as yet of any of these causing economic damage.

Newman's general observations apply to the above four species and not to a *Crambus* species or to *S. tritalis*. The larvae of *S. tritalis* also make silken tunnels and may be superficially confused with the larvae of the Crambinae; but they move rapidly compared to the Crambinae, and pupate at the somewhat thickened closed ends of their tunnels whereas the burrow linings of the Crambinae are of uniform thickness. Unlike these Crambinae, *S. tritalis* is multi-voltine in the south-west of Western Australia. Although adults of *S. tritalis* are occasionally present with the Crambinae, I have found the larvae mainly among couch grass, *Cynodon dactylon* (L.) Pers., on which they feed.

Most of the webworm investigations in the decade before 1960 were directed mainly at determining control measures (Anon 1951; Wallace and Mahon 1952; Jenkins and Forte 1952; Anon 1953; Jenkins 1958, 1960). But some of these papers have included a broad outline of the life cycle, the most detailed account being that by Wallace and Mahon. During this period I completed a thesis which included findings on the systematics and biology of webworm (Koch 1959).

Since 1960 the Department of Agriculture of Western Australia has carried out further webworm investigations (Button 1962), and still further work by Button has recently been published (Button 1963a, 1963b, 1963c, 1963d). These investigations were planned "so that more effective and more economical methods of control can be developed." The generic name *Talis* was retained for webworm. Unfortunately, Button did not distinguish between the life cycle stages of the four species, and as his results pertain to a mixed species population they are mostly of limited value.

Wallace and Mahon (1963) have discussed some important aspects of insecticidal treatment against webworm (*Talis* spp.) and other pasture pests.

As stated, Turner considered *Talis* and *Hednota* to be subjectively synonymous. Subsequently, Bleszynski and Collins (1962) have revived the concept of an independent *Hednota*, and list in *Hednota* forty-nine species including most of the Australian species formerly placed by Turner in *Talis*. They have allocated the four *Talis* species as follows: *Surattha panteucha*, *Hednota longipalpella*, *H. pedionoma* and *H. crypsichroa*. According to them *Talis* does not occur in Australia.

I do not agree with the placement of *panteucha* in *Surattha*. Bleszynski (personal communication) agrees with this view because of the close similarity of *panteucha* to many of the species listed in *Hednota* by Bleszynski and Collins (1962); therefore I place it in *Hednota*. All the previously known species treated in *Hednota* in this paper were included in this genus by Bleszynski and Collins (1962).

Taxonomy

Pyrilidae are small to medium-sized moths, usually with long legs, strong proboscis, labial palpi usually porrect, beak-like, or sometimes upwardly curved; three-segmented maxillary palpi, tympanal organs present at base of abdomen; and hindwings having $S_c + R_1$ fused with R_5 beyond the cell (Common 1963).

Crambinae are Pyralidae that have a well developed cubital pecten (long hairs on Cu) in the hindwing, labial palpi that are very long and porrect, and maxillary palpi that are well developed, triangular in shape, and strongly dilated distally with scales.

Genus HEDNOTA Meyrick

Hednota Meyrick, 1886, Trans. Ent. Soc. Lond. 1886: 270.

Type species.—*Crambus bifractellus* Walker, 1863 (List Lep. Ins. Coll. Brit. Mus 27: 174) by subsequent designation.

In describing the genus, Meyrick mentioned two species, *Hednota bifractella* and *H. argyroëles*. He gave *H. bifractella* as an especial example of the genus, which, of course, does not constitute a valid type designation. The earliest references I found to the type of *Hednota* are Zimmerman's statements in "Insects of Hawaii" Vol. 8 (1958); where in p. 343 he figures the male genitalia of *H. bifractella* as, "the type of the genus *Hednota*", and in p. 347 he says, "I have checked the genitalia of the type of *Hednota* (*bifractella* Walker) . . ." I accept as a designation these statements of Zimmerman's that *H. bifractella* is the type of *Hednota*. The same species has been accepted as the type of *Heanota* by Bleszynski and Collins (1962).

Diagnosis.— M_1 of the hindwing remote from R_5 and well removed from the upper angle of the cell, and in some this vein may be rudimentary or absent. Veins R_1 and R_5 are both present in the forewing, vein R_5 is not stalked with R_4 or R_3 (i.e. it arises separately from

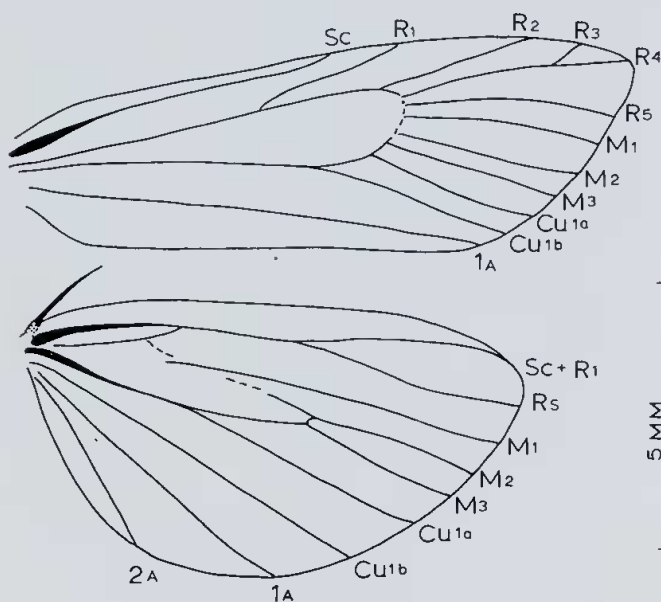


Figure 2.—Wing venation of *H. panteucha*, male, Koojan, W.A.

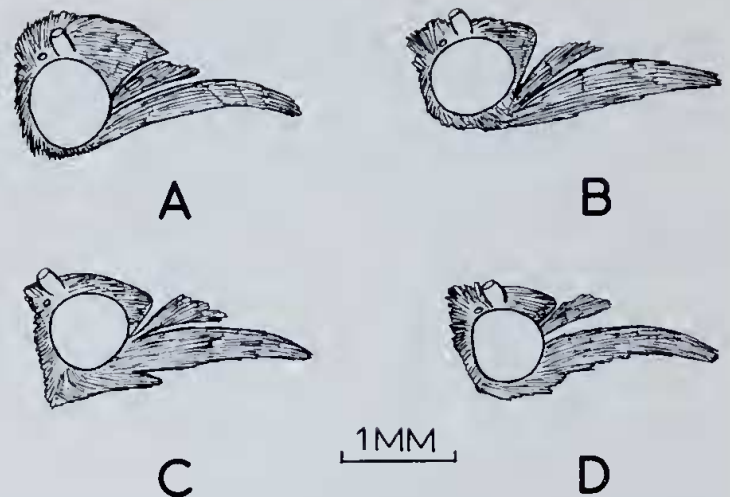


Figure 3.—Head and palpi of: A, *H. panteucha*, male, Koojan, W.A.; B, *H. longipalpella*, male, Nedlands, W.A.; C, *H. pedionoma*, male, Koonup, W.A.; D, *H. crypsichroa*, male, Nedlands, W.A.

the cell) and in the hindwing M_2 is present (Fig.2). The frons is prominent and conical (Fig.3).

Comments.—The genus was formed by Meyrick to include all the Australian species (except *lativittalis* Walker) formerly classed by him under *Thisanotia* [misspelled by Meyrick as *Thinasotia*, see Bleszynski and Collins (1962, p. 314)].

Hednota panteucha (Meyrick), comb. nov.

Figs.2; 3A; 4A; 5A; 6A,B,C; 7A

Thinasotia [sic] *panteucha* Meyrick, 1885, Trans. Ent. Soc. Lond. 1885: 453.

Surattha panteucha [sic] (Meyrick). Hampson, 1896, Proc. Zool. Soc. Lond. 1895: 966.

Talis panteucha (Meyrick). Turner, 1904, Proc. Roy. Soc. Qd 18: 171.

Surattha panteucha (Meyrick). Bleszynski and Collins, 1962, Acta Zool. Cracov. 7: 351.

Types.—Meyrick described the species from a single male, and the type-locality and comments were "Mount Lofty, South Australia; one specimen received from Mr. E. Guest, who took it in April, together with a second." The holotype is not in the British Museum (Natural History) (Whalley, personal communication).

Diagnosis.—This species can be distinguished from all other *Hednota* species, in the south-west of Western Australia, by the dark fuscous interveinal markings (Fig.4A) on the light yellow-ochreous ground colour of the forewing. The basal half of forewing veins M_5 to Cu_b are dark fuscous; there is a streak of dark fuscous above submedian fold from near base to before middle, another streak beneath costal margin of cell from one-fourth (of length of cell from base) to transverse vein, and the dark fuscous reappears as a wider streak to before apex. The forehead has a large acute conical projection. Labial palpi ochreous, mixed with dark fuscous towards apex; white internally and ventrally at base behind eyes. The head is shown in Figure 3A. The antennae are dark fuscous, the male strongly bipectinate and with teeth with fine evenly but sparsely spaced hairs and apices of teeth not noticeably dilate (Fig.5A). Legs ochreous whitish suffused with fuscous. The wing venation is shown in Figure 2.



20 MM

Figure 4.—A, *H. panteucha*, male, Parkside, S.A.; B, *H. longipalpella*, male, Nedlands, W.A.; C, *H. pedionoma*, male, Wongamine, W.A.; D, *H. crypsichroa*, male, Nedlands, W.A.; E, *H. recurvella*, male, Hamel, W.A.; F, *H. vittella*, male, Albany, W.A.; G, *H. dichospila*, male, Albany, W.A.; H, *H. vetustella*, male, Albany, W.A.

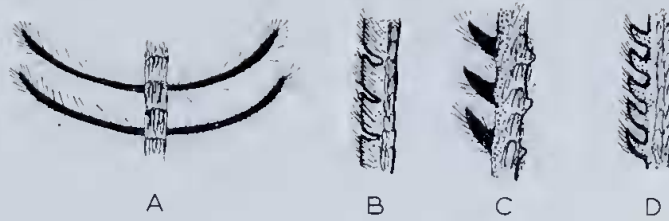


Figure 5.—Portion of antenna of male of: A, *H. panteucha*, Koojan, W.A.; B, *H. longipalpella*, Nedlands, W.A.; C, *H. pedionoma*, Koojanup, W.A.; D. *H. crypsichroa*, Nedlands, W.A.

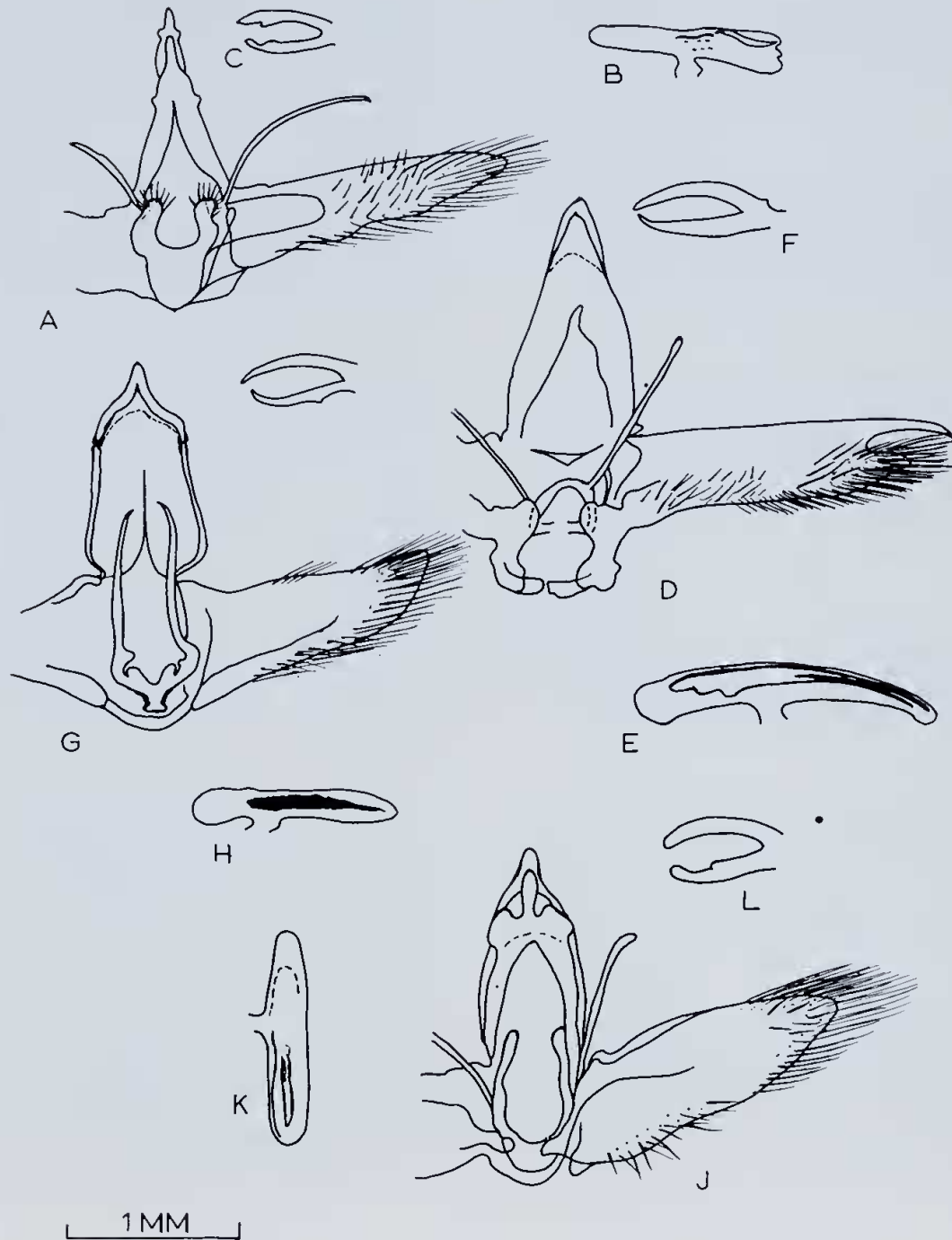


Figure 6.—Male genitalia of: A, B, C, *H. panteucha*, Koojan, W.A.; D, E, F, *H. longipalpella*, Koojan, W.A.; G, H, I, *H. pedionoma*, Koojan, W.A.; J, K, L, *H. crypsichroa*, Koojan, W.A.

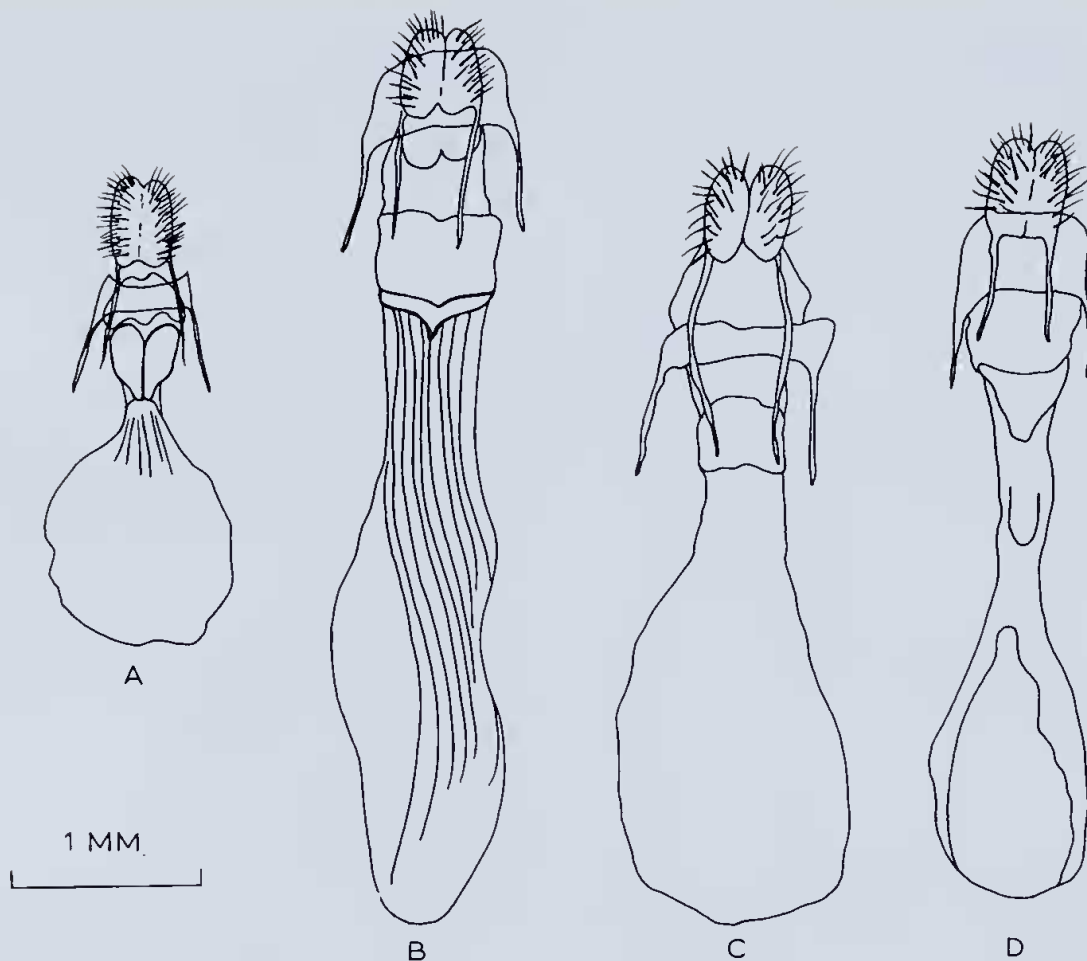


Figure 7.—Female genitalia of: A, *H. panteucha*, Koojan, W.A.; B, *H. longipalpella*, Koojan, W.A.; C, *H. pedionoma*, Koojanup, W.A.; D, *H. crypsichroa*, Koojanup, W.A.

Male genitalia (Fig. 6A,B,C).—Uncus short, pointed, with a lateroventral bulge on each side; gnathos arms uniting gradually; anellar arms long, terminating in a slightly downwardly curved point; valva simple with costa nearly straight, dorsum wavy, apex tapering to a narrow rounded point; aedeagus nearly straight.

Female genitalia (Fig. 7A).—Corpus bursae short and rounded; ductus bursae short with a few slightly sclerotized ribs; ostium bursae region strongly sclerotized, two distinct sclerotized plates rounded towards papillae anales, more pointed towards corpus bursae.

Expanse.—Male 21.0–25.5 mm, female 21.0–27.0 mm.

Specimens examined.—139♂, 80♀.

Queensland: Milmerran, Apr. 1946, J. Macqueen, 1♂ ANIC. New South Wales: Broken Hill, 16.ii.1900, 1♂ SAM; 10.v.1912, 3♂ 1♀ SAM. Victoria: Birchip, Mar. 1899, D6, 1♂ ANIC; Mar. 1899, 1♂ NM; Mar. 1902, 2♀ ANIC; 9.iv.1920, 1♂ 1♀ ANIC; Castlemaine, 5.iii.1908, 1♀ NM. Daytrap, 20.iii.1918, 1♂ AM; 20.iii.1918, 1♂ AM. Murtoa, 24.iii.1903, C.J.M., 1♂ ANIC, Nhill, 20.vi.1902, J.R.F., 1♂ ANIC. Walpeup, 23.iii.1920, 1♂ NM. South Australia: Adelaide (Waite Inst.), 26.iii.1958, 1♀ SAW; 20.iii.1959, 1♂ 2♀ SAW; 29.iii.1959, 1♀ SAW. Balhannah, 3.iv.1882, 1♂ SAM. Brentwood, 8.iv.1902, 1♂ ANIC. Crystal Brook, 24.iii.1962, MMHW, 6♂ 2♀ WAC. Parkside, 21.iii.1892, 353, 1♂ SAM; 31.iii.1892, 1♂ 1♀ SAM; 20.iii.1900, 1♂ SAM 1.iv.1918, 1♀ SAM. Pinnaroo, 2♀ SAM. Tintinara/Bordertown, 27.iii.1962, MMHW, 2♀ WAC. Western Australia: Dumbleyung, 27.iii.1963, H. Udeli, 1♂ 2♀ WAM. Goomalling, 18.iv.1951, CFHJ, 12♂ WADA; 14.iv.1952, DGS, 13♀ WADA; 15.iv.1952, DGS, 14♀ WADA; 16.iv.1952, DGS, 24♂ 2♀ WADA; 7.v.1952, PNF, 2♂ WADA; 14.iv.1953, DGS, 1♀ WAC. Koojanup, 1.iv.1959, MMHW, 1♂ ANIC; 1.iv.1959, 2♂ 1♀ WAC; 4.iv.1959, MMHW, 1♂ ANIC; 4.iv.1959, MMHW, 1♂ WAC; 24.iii.1960, JDB, 5♂ ANIC;

31.iii.1960, JDB, 2♂ ANIC; 19.iii.1961, MMHW, 5♂ WAM; 21.iii.1961, MMHW, 2♂ 1♀ WAM; 19.iii.1963, ALR, 2♂ WAC; 22.iii.1963, MMHW, 3♂ WAM; 23.iii.1963, ALR, 1♂ WAC; 26.iii.1963, ALR 4♂ WAC; 30.iii.1963, ALR, 1♂ WAC. Koojan, 24.iii.1961, LEK, 2♂ WAM; 26.iii.1961, LEK, 2♂ WAM; 28.iii.1961, LEK, 5♂ 1♀ WAM; 23.iv.1961, LEK, 1♀ WAM; 28.iii.1963, LEK, 1♂ WAM; 29.iii.1963, LEK, 2♂ WAM; 8.iv.1963, LEK, 5♂ 1♀ WAM; 9.iv.1963, LEK, 5♂ 2♀ WAM. Moora, 18.iv.1961, JAB, 20♂ 20♀ WAM; 19.iv.1962, RWB, 3♂ 3♀ WADA. Toodyay, 19.iv.1951, CFHJ, 1♂ WADA.

Distribution.—Queensland: Milmerran. New South Wales: Broken Hill. Victoria: Birchip, Castlemaine, Daytrap, Murtoa, Nhill, Walpeup. South Australia: Adelaide, Balhannah, Brentwood, Crystal Brook, Mt. Lofty, Parkside, Pinnaroo, Tintinara/Bordertown. Western Australia: Dumbleyung, Goomalling, Koojanup, Koojan. Moora, Toodyay.

Comments.—In the original description of *panteucha*, Meyrick stated that vein 5 [= M₂] of the hindwing is absent. But vein M₂ is present, and this is a further reason why I include *panteucha* in *Hednota*. Meyrick (1885) described the species from Mt. Lofty, South Australia; and Turner (1904) included Mt. Lofty as a locality. The following are at the British Museum (Natural History) (Whalley, personal communication); 1 specimen "S Austral. Nick Dohrn, Jul. 81 (Zeller Coll. 1384)"; 1 specimen "Parkside, S. Australia, 99-49"; 9 specimens "Parkside, S. Australia, Rothschild Bequest, B.M. 1939-1 (one bears the no. 75)"; and 1 specimen "Pinnaroo, Coll. Lower, Suratha *panteucha* Meyr., Id. by N. B. Tindale".

Hednota longipalpella (Meyrick)

Figs.3B; 4B; 5B; 6D,E,F; 7B

Eromene longipalpella Meyrick, 1879, Proc. Linn. Soc. N.S.W. 3: 196-7.

Talis longipalpellus (Meyrick). Hampson, 1896, Proc. Zool. Soc. Lond. 1895: 969.

Talis longipalpella (Meyrick). Turner, 1904, Proc. Roy. Soc. Qd 18: 172.

Hednota longipalpella (Meyrick). Bieszynski and Collins, 1962, Acta Zool. Cracov. 7: 351.

Types.—Meyrick described the species from an unspecified number of specimens and the type-locality and comment was "Near Melbourne; not scarce." One syntype is in the British Museum (Natural History) (Whalley, personal communication); I hereby designate as lectotype of *Eromene longipalpella* Meyrick this specimen, a female labelled "Melbourne, Victoria, G.H.R./78." Whalley has compared a slide of mine of female genitalia of a *longipalpella* against the genitalia of the lectotype and states, personal communication, that they agree exactly.

Diagnosis.—Forewing ochreous with some black and suffused with white; disc white and thickly and irregularly sprinkled with fine black; a transverse central fascia of the ochreous ground colour, sprinkled with whitish and blackish, gently angulated above and below middle, and bisected throughout by a violet-silvery metallic line; at two-thirds of disc, nearest to costa, is a crescentic violet-silvery metallic mark, margined with black internally and less strongly externally; a silvery metallic outwardly curved subterminal line (Fig.48B). Labial palpi twice as long as head (Fig.3B), whitish, mixed with dark fuscous, dark fuscous on sides, whitish ventrally towards base and white ventrally behind eyes. Antennae whitish ochreous, the male with wide teeth (Fig.5B). Legs are ochreous grey and there are ochreous white rings at the apices of tarsal joints. Wing venation essentially as in *H. panteucha* (Fig.2) but in the hindwings veins M_2 and M_3 do not leave the cell separately but are stalked for a short distance.

Male genitalia (Fig.6D,E,F).—Uncus and gnathos broad, sharply angled to apices; gnathos arms meeting abruptly; anellar arms straight, rounded at apices; anellus rounded towards gnathos; valva with costa nearly straight, then downcurved at apex to form a point, apex then has an inward arch which proceeds outwards to form a second more-rounded point of apex, dorsum slightly wavy; aedoeagus large, curved, with concave aspect on side of ductus ejaculatorius; cornutus as a pair of long thin horns, one somewhat longer and about twice as wide as other, both united at base.

Female genitalia (Fig.7B).—Corpus bursae elongate, rigid, somewhat sclerotized on part, with somewhat curved elongate ribs along its length; ostium bursae region strongly sclerotized, broader than deep, convex towards corpus bursae.

Expanse.—Male 18.0-26.2 mm, female 18.0-27.5 mm.

Specimens examined.—113 ♂, 98 ♀.

Queensland: Brisbane, 19.iii.1906, 1♂ ANIC; 20.iii.1906, 1♂ ANIC; 23.ii.1910, 1♂ ANIC; 11.iv.1921, 1♀ ANIC; 13.iii.1922, 1♀ ANIC; 6.iv.1943, 1♀ ANIC. Bunya Mts., 9.ii.1940, WBB, 1♂ QM; 21.ii.1940, 1♂ QM. Milmerran, 29.iii.1939, 1♀ ANIC. Stanthorpe, 8.ii.1930, WBB, 1♂

QM; 1♂ ANIC; Toowoomba, 1.iii.1921, WBB, 1♀ QM; 25.ii.1921, WBB, 1♂ QM; 10.iii.1931, 1♀ ANIC. New South Wales: Broken Hill, 4.iv.1890, 1♀ SAM; 2♂ 3♀ SAM. Scone 27.iii.1935, H. Nicholas, 1♂ ANIC. Australian Capital Territory: Black Mountain, 26.ii.1960, IFBC, 1♂ ANIC; 29.ii.1960, IFBC, 1♂ ANIC; 28.iii.1960, IFBC, 1♂ ANIC; 1.iv.1960, IFBC, 2♂ ANIC. Victoria: Birchip, 16.iv.1900, 1♂ ANIC. Towang, H. Jarvis, 1♀ QDAS. South Australia: Belair, 1♀ SAM; Blackwood, 2♀ SAM; Hallett, 17.xi.1893, 1♂ SAM; Parkside, 20.iii.1900, 1♂ SAM; Pinnaroo, 3♀ SAM. Western Australia: Albany, 4.iii.1926, WBB, 1♂ ANIC. Beverley, 3.iv.1962, JAB, 1♀ WADA; 4.iv.1962, P.J.L., 5♀ WADA; 17.iv.1962, JAB, 1♂ 2♀ WADA. Darlington, 9.iv.1962, JAB, 1♀ WADA; Goomalling, 18.iv.1951, CFHJ, 1♂ WADA; 14.iv.1953, DGS, 2♂ 7♀ WADA; 16.iv.1953, DGS, 2♀ WADA; Kojonup, 1.iv.1959, MMHW, 5♀ WAC; 10.iv.1959, JDB, 1♀ WAC; 17.iii.1960, MMHW, 17♂ 3♀ WAM; 15.iii.1961, MMHW, 8♂ 2♀ WAM; 19.iii.1961, MMHW, 3♂ WAM; 21.iii.1961, MMHW, 6♂ WAM; 7.iv.1961, MMHW, 2♂ WAM; 14.iv.1962, MMHW, 2♀ WAM; 12.iii.1963, ALR, 2♂ 10♀ WAC; 15.iii.1963, MMHW, 2♂ 1♀ WAM; 17.iii.1963, ALR, 3♂ 3♀ WAC; 22.iii.1963, MMHW, 10♂ WAM; 23.iii.1963, ALR, 3♂ 6♀ WAC; 30.iii.1963, ALR, 3♂ WAC; 3.iv.1963, ALR, 2♂ WAC. Koojan, 20.iii.1961, LEK, 1♂ WAM; 26.iii.1961, LEK, 1♀ WAM; 29.iii.1961, LEK, 1♂ WAM; 9.iv.1963, LEK, 2♂ 1♀ WAM; 4.v.1961, LEK, 1♂ WAM. Merredin, 23.iv.1962, AS, 3♀ WADA; 23.iv.1962, JAB, 1♀ WADA. Moora, 11.iv.1962, P.J.L. 1♂ 1♀ WADA. Nedlands, 28.iii.1959, MMHW, 4♀ WAC; 29.iii.1959, MMHW, 1♀ WAC; 31.iii.1959, MMHW, 1♀ WAC; 3.iv.1959, MMHW, 3♂ WAC; 7.iv.1959, MMHW, 2♀ WAC; 19.iii.1961, MMHW, 1♂ ANIC; 21.iii.1961, MMHW, 1♀ ANIC; 22.iv.1961, MMHW, 1♂ ANIC; 10.iv.1962, MMHW, 1♀ WAC; 18.iii.1963, 2♀ WAC; 23.iii.1963, MMHW, 1♂ 2♀ WAC; 25.iii.1963, MMHW, 1♂ 1♀ WAC; 26.iii.1963, MMHW, 1♂ WAC; 27.iii.1963, 1♀ WAC; 28.iii.1963, MMHW, 1♀ WAC; 30.iii.1963, 1♂ 1♀ WAC; 31.iii.1963, MMHW, 2♂ 2♀ WAC; 5.iv.1963, MMHW, 6♂ 3♀ WAC. Perth, Mathews, 1♀ ANIC. Roleystone, 3.iv.1962, LEK, 1♂ 1♀ WAM. Swan R., J. Clark, 1♀ ANIC. Three Springs, 6.iv.1962, JAB, 1♀ WADA.

Distribution.—Queensland: Brisbane, Bunya Mts., Milmerran, Stanthorpe, Toowoomba, Wallangarra. New South Wales: Broken Hill, Scone. Australian Capital Territory: Black Mountain. Victoria: Birchip, Brentwood, Melbourne, Towang. South Australia: Belair, Blackwood, Hallett, Parkside, Pinnaroo, Stephenson River. Western Australia: Albany, Beverley, Darlington, Goomalling, Kojonup, Koojan, Merredin, Moora, Nedlands, Perth, Roleystone, Swan River, Three Springs.

Comments.—When Meyrick described *longipalpella* he included *bifractella* in a key with it, treating both as *Eromene* species. Lower (1896, p. 252) gave Stephenson River (South Australia) as a locality, and Turner (1904) gave Melbourne and Brentwood (Victoria). The following are at the British Museum (Natural History) (Whalley, personal communication): 1 specimen "Melbourne, Victoria, G.H.R./78" (lectotype of *Eromene longipalpella*); and 1 specimen "Wallangarra, Queensland, A.J.T./95 (abdomen missing)".

Hednota pedionoma (Meyrick)

Figs.3C; 4C; 5C; 6G,H,I; 7C

Thinasotia [sic] *pedionoma* Meyrick, 1885, Trans. Ent. Soc. Lond. 1885: 453.

Talis pedionoma (Meyrick). Hampson, 1896, Proc. Zool. Soc. Lond. 1895: 968.

Talis pediononoma [sic] (Meyrick). Turner, 1904, Proc. Roy. Soc. Qd 18: 173.

? *Metasia bilunalts* Hampson, 1913, Ann. Mag. Nat. Hist. (8) 12: 4. [syn. ? nov.]

Hednota pedionoma (Meyrick). Bieszynski and Collins, 1962, Acta Zool. Cracov. 7: 316.

Types.—The species was described by Meyrick from an unspecified number of specimens of both sexes, and type-localities and comments were "Bathurst, New South Wales (2100 feet);

Mount Lofty, South Australia; in April, locally common in dry grassy places." Seven syntypes are in the British Museum (Natural History) (Whalley, personal communication). Following Whalley's selection, I hereby designate as lectotype of *Thinasotia pedionoma* Meyrick one of these specimens, a male labelled "Bathurst, N.S.Wales, grass, 15/4/79, B.M. slide No. 3971"; I have examined this genitalia slide. The holotype of *Metasia bilunalis* at the British Museum (Natural History) appears externally the same as *pedionoma* (Bleszynski, personal communication), and I therefore include it above as a possible synonym. Confirmation will have to await critical examination of its genitalia.

Diagnosis.—Forewing narrow, light fuscous and white, costal half suffused with ochreous towards base. Two obscure blackish parallel lines from middle of costa parallel to termen, incised costally to middle, not passing submedian fold, towards costa from middle both are bent inwards and coalesce to form a short black streak pointing towards base; a small roundish white, blackish-margined, discal spot; a short whitish streak from costa at five-sixths, preceded and followed by a darker suffusion on costa (Fig.4C). Forehead has a short cone (Fig. 3C). Labial palpi ochreous mixed with dark fuscous towards apex; white internally, and ventrally to behind eyes. Antennae grey, the male strongly dentate and with the apices of teeth moderately hairy (Fig.5C). Legs fuscous, but whitish ventrally. Wing venation essentially as in *H. panteucha* (Fig.2).

Male genitalia (Fig.6G,H,I).—Gnathos and uncus sharply curved inwards towards apices; apex of uncus rounded; gnathos arms uniting very gradually, with a backwardly pointing ventral bulge on each; anellar arms gradually tapering to inwardly turned points at apices; valva short, costa nearly straight, dorsum somewhat sharply upturned at apex, which is rounded; aedceagus with cornutus as a long very pointed horn consisting of numerous fine thorns pointing towards apex.

Female genitalia (Fig.7C).—Corpus bursae large, somewhat rounded; ostium bursae region strongly sclerotized, about as deep as broad; ductus bursae short, not sclerotized.

Expanse.—Male 18.8-25.4 mm, female 17.0-23.1 mm.

Specimens examined.—180 ♂, 86 ♀.

New South Wales: Armidale, 3.iv.1963, R. J. Roberts, 1 ♀ WAC. Killara, 23.iv.1920, 1 ♂ AM. Leura, 12.iv.1914, 1 ♂ AM. National Park (Sydney), 11.iv.1925, 1 ♀ AM; 25.iv.1925, 1 ♀ AM. Sydney, 28.iii.1941, 1 ♀ AM. Australian Capital Territory: Black Mountain, 28.iii.1951, IFBC, 3 ♀ ANIC; 4.iii.1960, IFBC, 1 ♂ ANIC; 28.iii.1960, IFBC, 1 ♂ 1 ♀ ANIC; 30.iii.1960, IFBC, 1 ♀ ANIC; 29.iii.1963, IFBC, 1 ♀ ANIC. Victoria: Birchip, 15.iv.1903, 1 ♂ NM; 20.iv.1903, 1 ♂ ANIC; 20.iv.1903, 1 ♀ NM; 18.iv.1904, 1 ♀ NM; 9.iv.1920, 3 ♀ ANIC; 10.ix.1920, 1 ♂ ANIC. Castlemaine, 3.iv.1907, W. E. Drake, 1 ♀ ANIC. Chelsea, 29.iii.1921, 1 ♂ NM. Cheltenham, 24.iv.1921, 1 ♂ NM. Croydon, 29.iii.1908, S. W. Fulton, 1 ♀ NM. Dunkeld, 17.iv.1923, 1 ♂ 2 ♀ ANIC. Gisborne, 30.iii.1908, G. Lyell, 1 ♀ NM. Glenelg, 7.iv.1923, 1 ♀ ANIC. Kerang, 10.iv.1951, C. J. R. Johnston, 1 ♀ QDAS. Moe, 28.iii.1934, C. G. L. Gooding, 1 ♀ QM. N. Melbourne 2 ♂ NM. Sea Lake, 29.iii.1906, 1 ♀ NM. Wimmera, H320, 1 ♂ SAM. Tasmania: Hobart, 1 ♀ ANIC. Launceston, 1.iv.1961, F. M. Littler, 1 ♂ 1 ♀ SAM. Mt. Barrow, 2500 ft, 3.iii.1963, IFBC and MSU, 1 ♂ ANIC. Pyengana, 1000 ft, 2.iii.1963, IFBC and MSU, 1 ♂ ANIC. Waratah, 3 miles E. of, 2000 ft, 17.ii.1963, IFBC and MSU, 2 ♂ ANIC. Westbury, 13 miles S. of, 4.iii.1963, IFBC and MSU, 1 ♂ ANIC. K 10226.

2 ♂ AM. South Australia: Blackwood, 1 ♂ SAM; 343, 1 ♂ SAM. Parkside, 31.iii.1892, 1 ♂ SAM; 1 ♂ SAM. Pinnaroo, 1 ♂ 3 ♀ SAM. Western Australia: Beverley, 11.iv.1962, P.J.L., 2 ♂ 5 ♀ WADA; 17.iv.1962, P.J.L., 1 ♂ 1 ♀ WADA; 20.iv.1962, P.J.L., 3 ♂ WADA; 24.iv.1962, P.J.L., 1 ♂ WADA; 27.iv.1962, P.J.L., 4 ♂ WADA. Denmark, 27.iii.1926, W.B.B., 1 ♂ 1 ♀ ANIC; 29.iii.1926 W.B.B., 1 ♀ ANIC; 4.iv.1926, W.B.B., 1 ♀ QM; 5.iv.1926, W.B.B., 1 ♂ ANIC; 5.iv.1926, W.B.B., 3 ♀ QM; 7.iv.1926, W.B.B., 1 ♀ QM; 13.iv.1926, W.B.B., 1 ♂ ANIC; 13.iv.1926, W.B.B., 1 ♀ QM. Goomalling, 16.iv.1951, D.G.S., 4 ♀ WADA; 18.iv.1951; CFHJ, 14 ♂ WADA; 2.v.1952, P.N.F., 2 ♂ WADA; 5.v.1952, P.N.F., 1 ♀ WADA; 7.v.1952, P.N.F., 5 ♂ WADA; 14.iv.1953, D.G.S., 1 ♀ WADA; 16.iv.1953, D.G.S., 4 ♀ WADA. Katanning, 22.iv.1950, J.A.M., 4 ♂ 1 ♀ WADA; 15.iv.1951, M.M.H.W., 1 ♂ WAC; 22.iv.1951, J.A.M., 1 ♂ ANIC. Kojonup, 1.iv.1959, M.M.H.W., 2 ♂ WAC; 4.iv.1959, M.M.H.W., 6 ♂ WAC; 10.iv.1959, J.D.B., 2 ♂ 7 ♀ WAC; 17.iv.1959, M.M.H.W., 1 ♂ WAC; 21.xi.1959, M.M.H.W., 1 ♂ ANIC; 31.iii.1960, J.D.B., 2 ♂ 1 ♀ ANIC; 6.iv.1961, M.M.H.W., 1 ♂ WAM; 14.iv.1962, M.M.H.W., 15 ♂ 2 ♀ WAM; 21.iii.1963, M.M.H.W., 3 ♂ 1 ♀ WAM; 23.iii.1963, ALR., 4 ♂ WAC; 3.iv.1963, ALR., 3 ♂ WAC; 12.iv.1963, ALR., 1 ♂ WAC; 21.iv.1963, M.M.H.W., 9 ♂ 1 ♀ WAM. Koojan, 22.iv.1961, LEK., 1 ♂ WAM; 23.iv.1961, LEK., 3 ♂ 1 ♀ WAM; 24.iv.1961, LEK., 1 ♂ WAM; 27.iv.1961, 4 ♂ WAM; 4.v.1961, LEK., 1 ♂ WAM; 8.iv.1963, LEK., 8 ♂ 1 ♀ WAM; 9.iv.1963, LEK., 3 ♂ 3 ♀ WAM. Merredin, 23.iv.1962, AS., 1 ♂ 2 ♀ WADA. Moora, 19.iv.1962, R.W.B., 3 ♂ 5 ♀ WADA. Mt. Ragged, 17 mi. N. of, 25.iv.1962, AMD, 2 ♀ WAM. Mukinbudin, 20.v.1959, S. J. Lavery, 1 ♀ WADA. Nedlands, 16.iv.1959, M.M.H.W., 2 ♂ WAC; 17.iv.1959, M.M.H.W., 1 ♂ WAC. Port Malcolm, 25.iv.1962, AMD, 1 ♂ WAM. Swan R., L.J.N., 1 ♂ ANIC; L.J.N., 1 ♂ WADA. Toodyay, 19.iv.1951, CFHJ, 2 ♂ WADA; 4.v.1952, CFHJ, 4 ♂ 1 ♀ WADA; 10.iv.1953, 7 ♂ 6 ♀ WADA; 13.iv.1953, CFHJ, 1 ♂ WADA; 15.iv.1953, L.J., 5 ♂ WADA; 20.iv.1953, L.J., 5 ♂ WADA; 1.iv.1959, CFHJ, 2 ♂ WADA. Wongamine, 13.iv.1960, J.A.M., 2 ♂ ANIC.

Distribution.—New South Wales: Armidale, Bathurst, Killara, Leura, Sydney. Australian Capital Territory: Black Mountain. Victoria: Birchip, Castlemaine, Chelsea, Cheltenham, Croydon, Dunkeld, Gisborne, Glenelg, Kerang, Moe, Melbourne, N. Melbourne, Sea Lake, Wimmera. Tasmania: Hobart, Launceston, Mt. Barrow, Pyengana, Waratah, Westbury. South Australia: Adelaide, Blackwood, Mt. Lofty, Parkside, Pinnaroo. Western Australia: Beverley, Bridgetown, Denmark, Goomalling, Katanning, Kojonup, Koojan, Merredin, Moora, Mt. Ragged, Mukinbudin, Nedlands, Port Malcolm, Swan River, Toodyay, Wongamine.

Comments.—Meyrick (1885) gave Mt. Lofty (South Australia) as a locality, Meyrick (1887) gave Wimmera (Victoria), Turner (1904) gave Bathurst (New South Wales), and Turner (1905) gave Bridgetown (Western Australia). The following are at the British Museum (Natural History) (Whalley, personal communication): 1 specimen "2940, Victoria, 89.114. *Metasia bilunalis* ♂ Hmps. Type"; 5 specimens "Bathurst, N.S.Wales, grass, 15.4.79 (one specimen with abdomen missing, one dissected Brit. Mus. Slide No. 3971)" (4 paralectotypes, and lectotype of *Thinasotia pedionoma*); 2 specimens "Mt. Lofty, S. Australia, O.L./82 (one specimen bears the following data: Australia 96.182, *Talis pedionoma* Meyr.) (paralectotype of *Thinasotia pedionoma*); 2 specimens "Melbourne, Victoria, W./93 (both without abdomen.)"; 1 specimen "Blackwood, S. Australia, O.L./98"; 2 specimens "Victoria SB./91 (one with abdomen missing)"; 1 specimen "Adelaide, S. Australia, R. .07, Brit. Mus. Slide No. 3972"; 8 specimens "Parkside, S. Australia, Rothschild Bequest, B.M. 1939-1 (four of these specimens bear the no. 73; one of these bears the following label: 97.23)"; 1 specimen "Bath. A16, '79"; and 1 specimen without data.

Hednota crypsichroa Lower

Figs.3D; 4D; 5D; 6J,K,L; 7D

Hednota crypsichroa Lower, 1893, Trans. Roy. Soc. S. Aust. 17: 166.

Prosmixis discilunalis Hampson, 1919, Ann. Mag. Nat. Hist. (9) 4: 147.

Talis crypsichroa (Lower). Turner, 1904, Proc. Roy. Soc. Qd 18: 174.

Hednota crypsichroa Lower. Bleszynski and Collins, 1962, Acta Zool. Cracov. 7: 314.

Types.—Lower described both sexes from an unspecified number of specimens, and the type-localities and comments were "Blackwood, Parkside, and Belair, usually at light, in March and April. An obscure though distinct species." I have dissected the genitalia of a South Australian Museum specimen, a male, labelled "Parkside" and "Type", which I hereby designate as lectotype of *Hednota crypsichroa* Lower.

Hampson (1919) gave the type-locality and comments for the synonym, *Prosmixis discilunalis*, as follows: "Victoria, Melbourne (Anderson), 1 ♂ type. Exp. 22 mm." The holotype, which is in the British Museum (Natural History) (Whalley, personal communication), has not been examined by me. But Whalley has compared a slide of mine of the male genitalia of *crypsichroa* with the genitalia of the holotype of *P. discilunalis* (Brit. Mus. Slide No. 7112) and states, personal communication, that they agree exactly.

Diagnosis.—Forewing varies from ochreous white to fuscous, usually with a suffused blackish streak along fold from base towards tornus; a transverse elongate discal spot, outlined with blackish, beyond middle, generally suffusedly bordered on either side with fuscous patches (Fig.4D). Labial palpi two to three times as long as head (Fig.3D), whitish ochreous, fuscous tinged, fuscous beneath. Antennae light fuscous, the male with teeth about as wide at base as the distance between teeth (Fig.5D). Legs whitish, fuscous tinged. Wing venation essentially as in *H. panteucha* (Fig.2).

Male genitalia (Fig.6J,K,L).—Uncus short, rounded; gnathos rounded, along each arm of gnathos there is a lobe, which shows as an inward bulge from lateral view; anellar arms curved and rounded at apices; valva short, broad at base tapering somewhat sharply to apex; aedoeagus with cornutus as two somewhat short horns.

Female genitalia (Fig.7D).—Corpus bursae with internal sclerotization; ductus bursae long, with some sclerotization; ostium bursae region triangular with apex pointing towards corpus bursae.

Expanse.—Male 19.7-24.0 mm, female 19.2-29.0 mm.

Specimens examined.—143 ♂, 49 ♀.

New South Wales: Broken Hill, 10.v.1912, 1 ♂ 2 ♀ SAM; 10.iv.1913, 1 ♂ SAM; 10.iv.1963, 1 ♂ SAM; 10 ♀ SAM. Australian Capital Territory: Black Mountain, 4.iii.1960, IFBC, 1 ♂ ANIC; 7.iii.1960, IFBC, 1 ♂ ANIC. Victoria: Birchip, Mar. 1902, 1 ♂ ANIC; 3.iii.1920, 6 ♂ 1 ♀ ANIC; 27.iii.1920, 1 ♂ ANIC; 30.iii.1920, 1 ♂ QM. Castlemaine, 21.iii.1907, 1 ♂ NM. Gisborne, 16.iii.1900, 1 ♂ ANIC. Sea Lake, 24.iii.1906, 1 ♂ 1 ♀ NM. Walpeup, 12.iv.1920, 1 ♀ NM. South Australia: Blackwood, 2 ♂ SAM. Crystal Brook, 24.iii.1962, MMHW, 1 ♂ 1 ♀ WAC. Parkside, 22.iii.1892, 300, 1 ♂ SAM; 4.iv.1919, 2 ♂ SAM; 6.iv.1919,

1 ♀ SAM; 1361, 1 ♂ SAM; 1 ♂ (lectotype of *Hednota crypsichroa*) SAM. Pinnaroo, 20.v.1915, 1 ♂ SAM. Tintinara/Bordertown, 27.iii.1962, MMHW, 1 ♀ WAC. Yorke Peninsula, 24.iii.1891, 1 ♀ SAM; 25.ii.1896, 1 ♀ SAM; 11.iii.1896, 1 ♂ SAM; 17.iii.1896, 1 ♂ SAM. Western Australia: Beverley, 5.iv.1962, P.J.L, 1 ♂ WADA; 12.iv.1962, P.J.L, 1 ♂ WADA; 17.iv.1962, P.J.L, 1 ♂ WADA; 27.iv.1926, P.J.L, 1 ♂ WADA. Denmark, 19.iii.1926, WBB, 1 ♂ ANIC; 26.iii.1926, WBB, 1 ♂ 1 ♀ QM; 27.iii.1926, WBB, 3 ♂ QM; 28.iii.1926, WBB, 1 ♂ QM; 30.iii.1926, WBB, 2 ♂ ANIC; 2.iv.1926, WBB, 1 ♂ ANIC; 2.iv.1926, WBB, 1 ♂ ANIC; 3.iv.1926, WBB, 1 ♀ ANIC; 3.iv.1926, WBB, 2 ♂ QM; 4.iv.1926, WBB, 1 ♂ ANIC; 4.iv.1926, WBB, 1 ♀ QM; 5.iv.1926, WBB, 1 ♀ ANIC. Donnybrook, Apr. 1928, 2 ♂ NM. Goomalling, 14.iv.1953, DGS, 2 ♂ WADA; 18.iv.1951, CFHJ, 4 ♂ WADA. Katanning 15.iv.1951, MMHW, 1 ♀ WAC. Kojonup, 1.iv.1959, MMHW, 4 ♀ WAC; 4.iv.1959, MMHW, 1 ♂ WAC; 9.iv.1959, JDB, 3 ♂ WAC; 10.iv.1959, JDB, 1 ♂ 8 ♀ WAC; 17.iii.1960, MMHW, 10 ♂ WAM; 22.iii.1961, MMHW, 6 ♂ 1 ♀ WAM; 6.iv.1961, MMHW, 11 ♀ WAM; 14.iv.1962, MMHW, 1 ♀ WAM; 12.iii.1963, ALR, 5 ♂ 2 ♀ WAC; 23.iii.1963, ALR, 3 ♂ 1 ♀ WAC; 30.iii.1963, ALR, 5 ♂ WAC. Koojan, 18.iii.1961, LEK, 4 ♂ WAM; 20.iii.1961, LEK, 15 ♂ WAM; 4.iv.1963, LEK, 4 ♂ WAM; 8.iv.1963, LEK, 3 ♂ WAM; 9.iv.1963, LEK, 4 ♂ WAM. Moora, 19.iv.1961, JAB, 1 ♀ WADA; 11.iv.1963, P.J.L, 3 ♂ WADA. Nedlands, 2.iv.1959, MMHW, 2 ♂ WAC; 6.iv.1959, MMHW, 1 ♀ WAC; 16.iv.1959, MMHW, 2 ♂ 1 ♀ WAC; 27.iii.1961, MMHW, 1 ♂ ANIC; 30.iii.1961, MMHW, 1 ♂ ANIC; 5.iv.1962, MMHW, 1 ♂ ANIC; 29.iii.1963, MMHW, 1 ♂ WAC. Roleystone, 3.iv.1962, LEK, 1 ♂ 1 ♀ WAM. Three Springs 1.iv.1962, JAB, 2 ♀ WADA; 9.iv.1962, JAB, 1 ♂ WADA. Toodyay, 4.v.1952, CFHJ, 1 ♂ WAC. Waroona, Apr. 1907, GFB, 1 ♂ NM.

Distribution.—New South Wales: Broken Hill. Australian Capital Territory: Black Mountain. Victoria: Birchip, Castlemaine, Gisborne, Melbourne, Sea Lake, Walpeup. South Australia: Adelaide, Belair, Blackwood, Crystal Brook, Mt. Lofty, Parkside, Pinnaroo, Tintinara/Bordertown, Yorke Peninsula. Western Australia: Beverley, Denmark, Donnybrook, Goomalling, Katanning, Kojonup, Koojan, Moora, Nedlands, Roleystone, Three Springs, Toodyay, Waroona.

Comments.—Appearance of forewing variable, but distinguishable mainly by the transverse elongate discal spot, which is usually suffusedly bordered on either side with fuscous patches; and often distinguishable by the presence of the suffused blackish streak along fold from base towards tornus. This blackish streak is, as a rule, not as dark as the black streak pointing towards base in the forewing of *H. pedionoma*. Lower (1893) gave Belair (South Australia) as a locality, and Turner (1904 and 1937) gave Adelaide and Mount Lofty (South Australia). The following specimen is at the British Museum (Natural History) (Whalley, personal communication): "Nr. Melbourne, Victoria, I-III.90 Anderson 1890, *Talis discilunalis* type ♂ Hmps. Pyralidae, Brit. Mus. Slide No. 7112."

Hednota recurvella (Walker)

Fig.4E

Crambus recurvellus Walker, 1863, List Lep. Ins. Coll.

Brit. Mus. 27: 171.

Talis recurvellus (Walker). Hampson, 1896, Proc. Zool Soc. Lond. 1895: 968.

Talis recurvellus (Walker). Turner, 1904, Proc. Roy. Soc. Qd 18: 172.

Hednota recurvellus (Walker). Bleszynski and Collins, 1962, Acta Zool. Cracov. 7: 317.

Types.—Type-locality "West Australia". Described by Walker from the female "from Mr. Clifton's collection". The holotype (label data "W. Australia 47/109") (abdomen missing) is in the British Museum (Natural History) (Whalley, personal communication). Also see comments under next species, *H. vittella*.

Diagnosis.—This species can be distinguished from all other *Hednota*, in the south-west of Western Australia, in that the two main stripes on the forewing are both sharply recurved towards the apex (Fig. 4E). The bright apricot background colour of the forewing is also a prominent characteristic. The thorax has a bright apricot stripe on each side.

Specimens examined.—19 ♂, 16 ♀.

Western Australia: Applecross, Feb. 1956, DGS 1♀ WADA. Capel, Jan. 1944, PNF, 1♀ WADA. Hamel, 14.xii.1913, R.I., 2♂ ANIC; 14.xii.1913, R.I., 1♂ QM; 14.xii.1913, R.I., 2♂ SAM; 30.xii.1913, 2♂ SAM. Koojan, 24.iii.1961, LEK, 1♀ WAM. Nedlands, 19.i.1961, MMHW, 1♂ ANIC; 21.ii.1961, MMHW, 1♀ ANIC; 28.ii.1961, MMHW, 1♂ ANIC; 30.xi.1961, JAM, 1♂ ANIC. Perth, 7.i.1926, WBB, 1♂ QM; 25.xi.1938, 1♀ ANIC; 3537, 1♂ SAM; 1♀, SAM. Swan R., LJN, 2♀ WADA. W. Perth, 29-1491, 1♀ WAM. Walpole, 15 mi. N.W. of, 15.xi.1958, IFBC, 2♂ 1♀ ANIC. Wanneroo, 15.iv.1963, GSMC, 1♀ WAC. Waroona, 13.xii.1906, GFB, 1♀ ANIC; 30.xii.1907, GFB, 1♀ ANIC; 18.xii.1907, GFB, 1♀ AM; 10.i.1908, GFB, 1♀ AM; 27.xi.1913, GFB, 1♂ AM; 28.xi.1913, GFB, 1♂ AM; 13.i.1926, WBB, 1♂ QM. J. Clark, 1♂ NM. K 10233, 1♂ AM. 23-14, 1♀ WAM.

Comments.—See under next species, *H. vittella*.

Hednota vittella (Suederus)

Fig. 4F

Tinea vittella Suederus, 1787, Act. Holm.: 227.
 ?*Tinea bivittella* Donovan, 1805, Ept. N.H.Ms. New Holland.
 ?*Crambus trivittatus* Zeller, 1863, Chil. Cramb. Gen. Spec.: 34.
Crambus bivittella [sic] (Donovan). Walker, 1863, List Lep. Ins. Coll. Brit. Mus. 27: 171.
Talis bivittellus (Donovan). Hampson, 1896, Proc. Zool. Soc. Lond. 1895: 968.
Crambus trivittalis Zeller. Hampson, 1896, Proc. Zool. Soc. Lond. 1895: 968. (Misspelling of *trivittatus*; according to Bleszynski and Collins, 1962, Acta Zool. Cracov. 7: 317.)
Talis bivittella (Donovan). Turner, 1904, Proc. Roy. Soc. Qd 18: 172.
Hednota vittella (Suederus). Bleszynski and Collins, 1962, Acta Zool. Cracov. 7: 317.

Types.—See comments.

Diagnosis.—Distinguished from all other *Hednota* species, in the south-west of Western Australia, in that only the first of the two main stripes on the forewing is recurved upwards towards the apex; the second is slightly down-curved (Fig. 4F). Background colour of forewing yellowish brown. The thorax has a yellowish brown stripe on each side.

Specimens examined.—6 ♂, 4 ♀.

Western Australia: Albany, 5.iii.1926, WBB, 1♂ QM. Applecross, Mar. 1951, W. M. O'Donnell, 3♀ WADA. Beverley, F. H. du Boulay, 1♂ SAM. Cunderdin, 9.vi.1913, S. Lundy, 7258, 1♂ WAM. Mt. Barker, LJN, 1♂ WADA. Nedlands, 16.iv.1960, MMHW, 1♂ ANIC. Wanneroo, 27.iv.1963, GSMC, 1♂ WAC. K 10228, 1♂ AM.

Comments.—In the literature, the identity of this species and that of the previous one, *H. recurvella*, has been badly confused. Meyrick (1879) considered *Crambus recurvellus* Walker to be a synonym of *Tinea bivittella* Donovan, and considered that Walker (1863) confused *bivittellus* and *trivittatus*. The sorting of the problem of the identity of *H. recurvella* and *H. vittella* in the literature cannot be achieved without a special investigation of the literature and the types. Therefore the first three citations of the synonymy I give above for *H. vittella* are a direct copy from Bleszynski and Collins (1962, p. 317). I have not examined any of the types of the species in the synonymy and

I have not seen the description by Suederus, Donovan or Zeller. To avoid complication, I have excluded the views of Meyrick (1879) from the synonymy for *H. recurvella* and *H. vittella*; and to clarify the situation, I compare his names with my present classification and that of Walker (1863) in Table 1.

Table 1

H. recurvella and *H. vittella* compared with the classifications by Meyrick and Walker

Koch (this paper)	Meyrick (1879)	Walker (1863)
<i>Hednota recurvella</i> (Walker)	<i>Crambus bivittellus</i> (Donovan) Syn.: <i>Crambus recurvellus</i> Walker	<i>Crambus recurvellus</i> , sp. nov.
<i>Hednota vitella</i> (Suederus)	<i>Crambus trivittatus</i> (Zeller) Syn.: <i>bivittellus</i> * (Walker)	<i>Crambus bivittella</i> (Donovan)

* I have been unable to trace this name [LEK].

Hednota dichospila (Turner)

Fig. 4G

Talis dichospila Turner, 1937, Proc. Soc. Qd 48: 67.
Hednota dichospila (Turner). Bleszynski and Collins, 1962, Acta Zool. Cracov. 7: 315.

Types.—The species was described from one female received by Turner from Mr. W. H. Mathews from Perth, Western Australia. I have examined the holotype (label data "Perth, W.A., Mathews") in the Australia National Insect Collection.

Diagnosis.—Can be distinguished from the other *Hednota* species, in the south-west of Western Australia, by the markings on the forewing which are: the dark fuscous costal streak from base to three-fifths, suffusedly edged with whitish, which extends on costa to four-fifths; the small fuscous transverse mark in disc at one-third, and a larger one at two-thirds; the slender white subterminal line inwardly oblique from costa before apex, soon curved outwards and sinuate to tornus; the white apical spot preceded by a fuscous costal spot; and the pair of blackish-edged distinct white spots on termen just above tornus (Fig. 4G). Antennae fuscous, the male strongly bipectinate.

Specimens examined.—6 ♂, 7 ♀.

Western Australia: Albany, 23.ii.1926, WBB, 1♂ QM; 1.iii.1926, WBB, 1♂ ANIC; 3.iii.1926, WBB, 1♂ ANIC; 4.iii.1926, WBB, 1♂ QM. Denmark, 17.iii.1926, WBB, 1♂ QM; 25.iii.1926, WBB, 1♀ ANIC; 28.iii.1926, WBB, 1♀ ANIC. Kojonup, 21.iii.1961, RJP, 1♀ ANIC. Nedlands, 28.iii.1963, MMHW, 1♀ WAC; 5.iv.1963, MMHW, 1♀ WAC. Perth, Mathews, 1♀ (holotype of *Talis dichospila*) ANIC. Wanneroo, 29.iii.1962, GSMC, 1♂ ANIC; 3.iv.1962, GSMC, 1♀ ANIC.

Hednota vetustella (Walker)

Fig. 4H

Crambus vetustellus Walker, 1863, List Lep. Ins. Coll. Brit. Mus. 27: 176.
 ? *Crambus demissalis* Walker, 1863, List. Lep. Ins. Coll. Brit. Mus. 27: 176.
Hednota asterias Meyrick, 1887, Trans. Ent. Soc. Lond. 1887: 250.
Hednota vetustellus (Walker). Bleszynski and Collins, 1962, Acta Zool. Cracov. 7: 317.

Types.—*C. vetustellus* and *C. demissalis* were both described by Walker from the male, and the type-locality and comments were "Swan River, Presented by Sir J. Richardson." *H. asterias* was described by Meyrick from the male, and the type-locality and comments were "Albany, West. Australia; one specimen in December". The holotypes of *C. vetustellus* (label data "Swan River 43/14") (abdomen missing) and *H. asterias* (label data "Albany, W. Australia 2/12/86; B.M. Pyralidae Slide No. 7136 ♂; 231 Bleszynski 195"), but not of *C. demissalis*, are at the British Museum (Natural History) (Whalley, personal communication). Also see comments.

Diagnosis.—Distinct from all other Western Australian *Hednota* species, in that the forewing has a rounded apex, is dark cinereous, minutely black-speckled along the veins, and has a whitish discal point (Fig. 4H).

Specimens examined.—4 ♂, 4 ♀.

Western Australia: Albany, 15.ii.1926, WBB, 1 ♀ ANIC; 15.ii.1926, WBB, 1 ♂ QM; 19.ii.1926, WBB, 1 ♂ QM; 21.ii.1926, WBB, 1 ♀ ANIC; 23.ii.1926, WBB, 1 ♂ ANIC; 22.iii.1926, WBB, 1 ♀ QM; 27.iii.1926, WBB, 1 ♀ QM. Denmark, 17.iii.1926, WBB, 1 ♂ ANIC.

Comments.—Bleszynski and Collins (1962 p.317) consider *asterias* a synonym of *vetustella*. The description of *asterias* applies to *vetustella*, and I too consider *asterias* to be a synonym of *vetustella*.

In this paper, I include *C. demissalis* as a possible synonym of *H. vetustella*. However, I have been unable to find any specimens fitting the description of *C. demissalis*, which has been included in *Hednota* by Bleszynski and Collins (1962). Meyrick (1887) stated that *C. demissalis* was represented in the British Museum (Natural History) by a specimen of *H. asterias*. Hampson (1896 p.968) stated that the type of *C. demissalis* was in the British Museum (Natural History) and that Walker's description did not agree with his supposed type. And Hampson considered *C. demissalis* to be a subjective synonym of *asterias*. The type of *C. demissalis* has not been seen at the British Museum (Natural History) since the time of Walker's original description (Whalley, personal communication).

Hednota hagnodes (Turner)

Fig.8A

Talis hagnodes Turner, 1942, Proc. Roy. Soc. Qd 53: 83.

Hednota hagnodes Turner, Bleszynski and Collins, 1962, Acta Zool. Cracov. 7: 315.

Types.—Turner gave the type-locality and comments "Albany in February; Denmark in March; five specimens received from Mr. W. B. Barnard. Type in Queensland Museum." The holotype (T.6341), a male, is in the Queensland Museum and has label data "Denmark, W.A., 13-3-26, W. B. Barnard" (J. T. Woods, personal communication).

Diagnosis.—Forewing has a subrectangular apex, is pale brownish ochreous, and has some sparsely scattered fuscous (Fig.8A).



20MM

Figure 8 (next column).—A, *H. hagnodes*, male, Denmark, W.A.; B, *H. milvella*, male, Albany, W.A.; C, *H. peripeuces*, male, Albany, W.A.; D, *H. hoplitella*, male, Albany, W.A.; E, *H. relatalis*, male, Denmark, W.A.

Specimens examined.—8♂, 1♀.

Western Australia: Albany, 15.ii.1926, WBB, 1♂ ANIC; 8.iii.1926, WBB, 1♂ ANIC. Denmark, 9.iii.1926, WBB, 1♂ QM; 12.iii.1926, WBB, 1♂ QM; 13.iii.1926, 2♂ ANIC; 13.iii.1926, WBB, 1♂ QM; 16.iii.1926, WBB, 1♂ ANIC. Nedlands, 5.iv.1962, MMHW, 1♀ ANIC.

Comments.—This species can be distinguished from *H. vetustella* by the colour of the forewing and the shape of its apex.

***Hednota milvella* (Meyrick)**

Fig.8B

Crambus milvellus Meyrick, 1879, Proc. Linn. Soc. N.S.W. 3: 181.

Talis milvellus (Meyrick). Hampson, 1896, Proc. Zool. Soc. Lond. 1895: 967.

Talis milvella (Meyrick). Turner, 1904, Proc. Roy. Soc. Qd 18: 172.

Hednota milvellus (Meyrick). Bleszynski and Collins, 1962, Acta Zool. Cracov. 7: 316.

Types.—Described by Meyrick from one male, and the type-locality and comments were “near Sydney, in March”. The holotype (label data “Sydney N.S. Wales 22/3/78”) is in the British Museum (Natural History) (Whalley, personal communication).

Diagnosis.—This is a very distinct species; it is the smallest (expanse 13.0 mm) of all the Western Australian *Hednota*. The forewing is dark fuscous, especially towards the apex, which is strongly produced. The rather broad white streak from base to middle of disc, there deflexed upwards and running to costa just beyond two-thirds, and the white streak from three-fourths of fold to apex, are characteristic of this species (Fig. 8B).

Specimens examined.—3♂.

Western Australia: Albany, 23.iii.1926, WBB, 3♂ QM.



Figure 10.—Portion of antenna of male of: A, *H. peripeuces*, Nedlands, W.A.; B, *H. relatalis*, Koojan, W.A.; C, *H. koojanensis*, sp. nov., Koojan, W.A.; D, *H. empheres*, sp. nov., Nedlands, W.A.

***Hednota peripeuces* (Turner)**

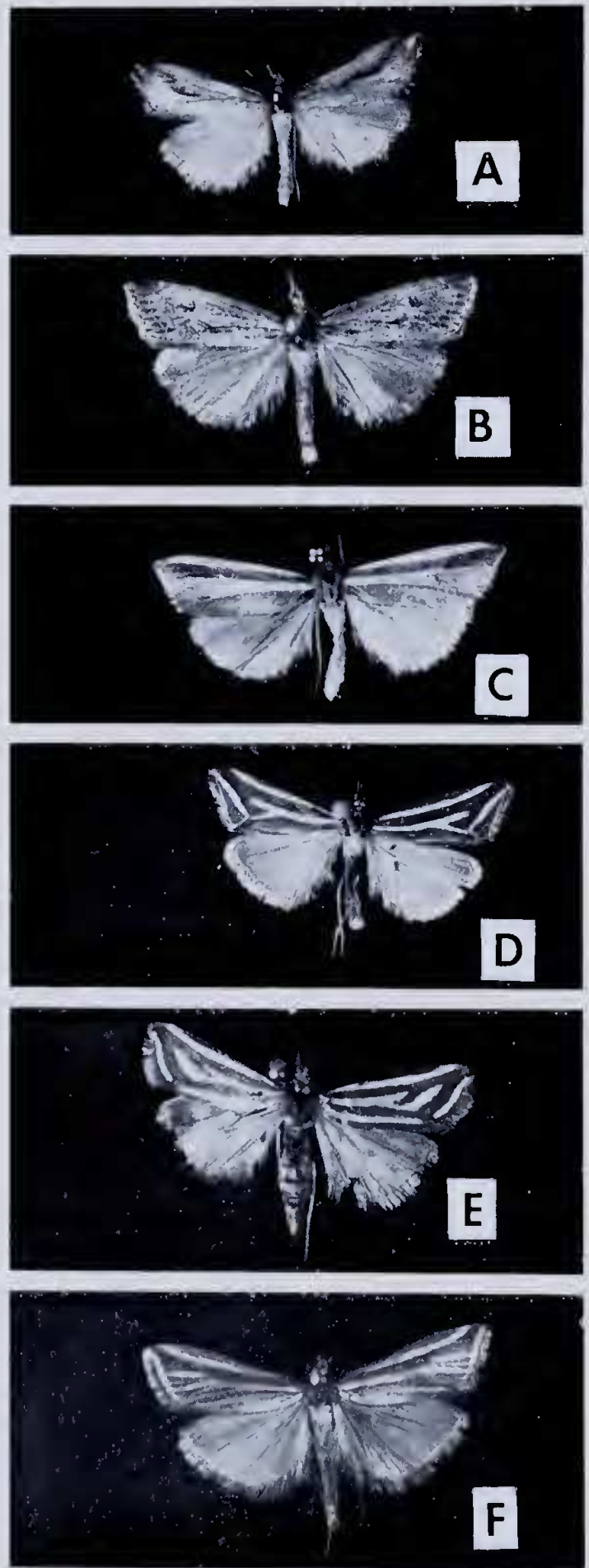
Figs.8C; 10A; 11A,B,C; 12A

Talis peripeuces Turner, 1942, Proc. Roy. Soc. Qd 53: 84.

Hednota peripeuces (Turner). Bleszynski and Collins, 1962, Acta Zool. Cracov. 7: 316.

Types.—Turner gave the type-locality and comments “Albany in March; six specimens received from Mr. W. B. Barnard. Type in Queensland Museum”. I have dissected the genitalia (Slide no. T.6343a) of the holotype (T.6343), a male, labelled “Albany, W.A., 1-3-26, W. B. Barnard”, in the Queensland Museum.

Figure 9 (next column).—A, *H. cotylophora*, male, Denmark, W.A.; B, *H. ancylosticha*, sp. nov. (holotype), male, Koojan, W.A.; D, *H. tenuilineata*, sp. nov. (holotype), male, Koojan, W.A.; E, *H. odontoides*, sp. nov. (holotype), female, Nedlands, W.A.; F, *H. empheres*, sp. nov. (holotype), male, Nedlands, W.A.



20 MM

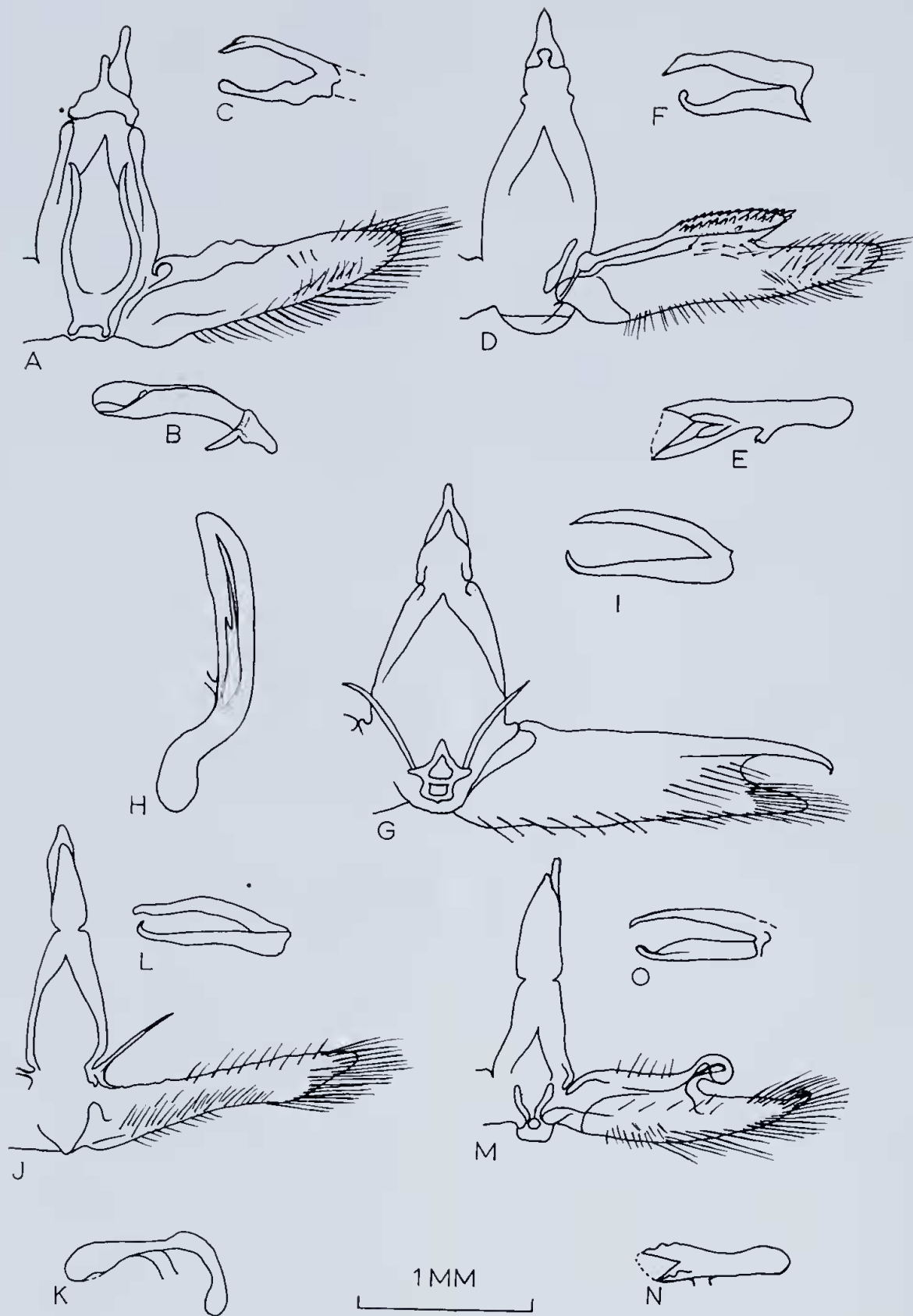


Figure 11.—Male genitalia of: A, B, C, *H. peripeuces*, Nedlands, W.A.; J, K, L, *H. koojanensis*, sp. nov., Koojan, W.A.; M, N, O, *H. empheres*, sp. nov., Koojan, W.A.

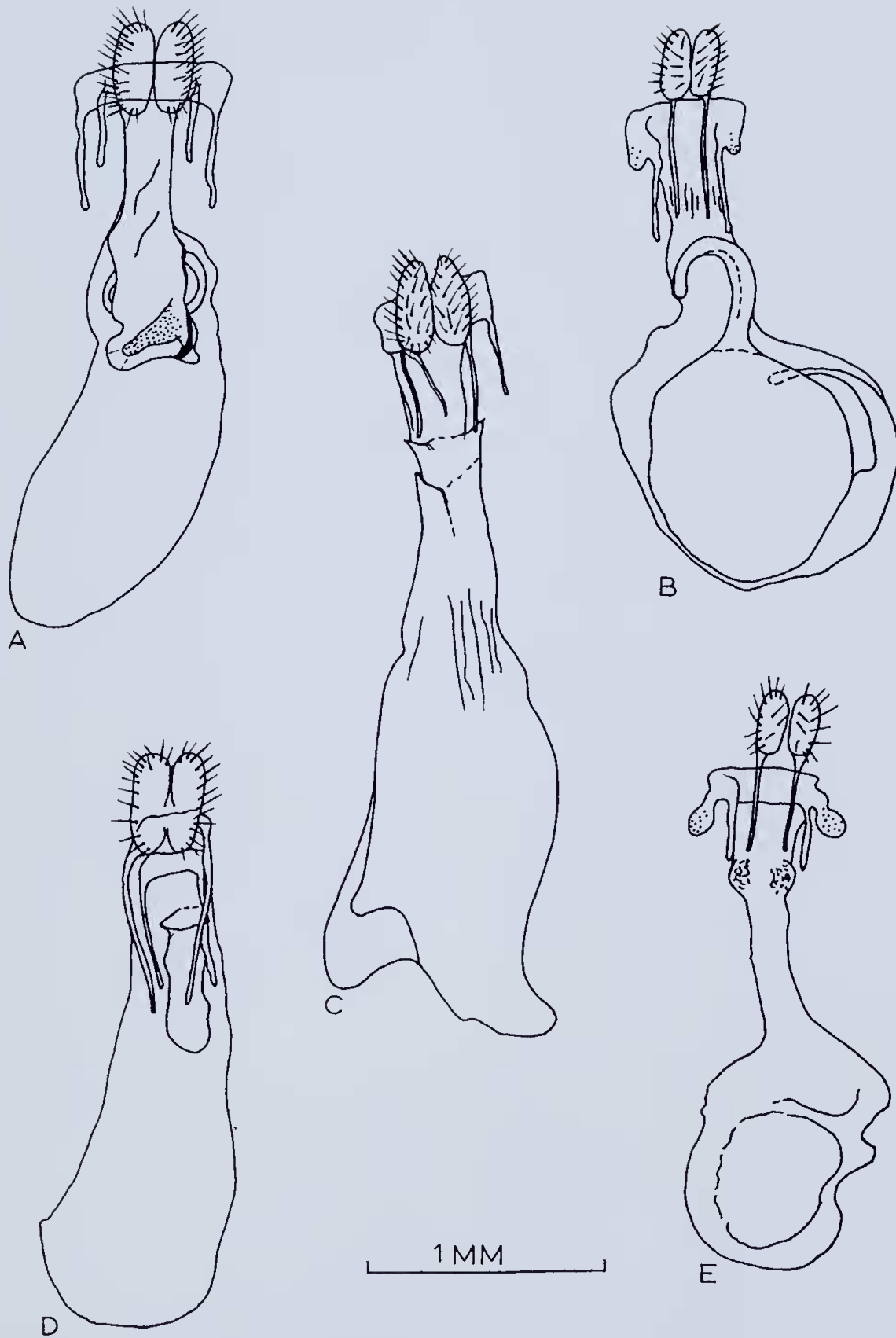


Figure 12.—Female genitalia of: A, *H. peripeuces*, Kojonup, W.A.; B, *H. ancylosticha*, sp. nov., Kojonup, W.A.; D, *H. koojanensis*, sp. nov., Koojan, W.A.; E, *H. empheres*, sp. nov., Koojan, W.A.

Diagnosis.—Can be distinguished by the forewing which is brownish grey partly suffused with white and partly sprinkled with fuscous; and has a white subcostal streak, from base to near apex, pale ochreous brown on costal side and with a dark fuscous line on lower edge; a distinct blackish dot in disc at two-thirds; and dorsal area of white with fuscous irroration and some pale ochreous streaks on veins (Fig.8C). Male antennae with long narrow teeth wide apart (Fig.10A).

Male genitalia (Fig.11A,B,C).—Uncus and gnathos elongated towards rounded apex; anellar arms outwardly curved and pointed at apex; costa of valva wavy and curled inwards at base; aedeagus rounded at apex.

Female genitalia (Fig.12A).—Corpus bursae elongate, rounded at bottom; ductus bursae heavily sclerotized at bottom towards corpus bursae.

Specimens examined.—17♂, 4♀.

Western Australia: Albany, 1.iii.1926, WBB, 4♂ (including holotype of *Talis peripeuces*) QM; 2.iii.1926, WBB, 4♂ ANIC; 2.iii.1926, WBB, 1♂ QM. Kojonup, 24.iii.1962, MMHW, 1♂ WAM; 12.iii.1963, ALR, 1♂ 1♀ WAC. Nedlands, 12.iii.1963, MMHW, 1♀ ANIC; 18.iii.1963, MMHW, 1♂ WAC; 28.iii.1963, MMHW, 1♂ WAC; 2.iv.1963, MMHW, 1♀ WAC; 5.iv.1963, MMHW, 2♂ WAC; 28.iv.1963, MMHW, 1♂ WAC; 15.iv.1964, MMHW, 1♂ WAC. Wanneroo, 15.iv.1963, GSMC, 1♀ WAC.

Comments.—Said by Turner (1942) to be nearest to *invalidella* [a Tasmanian species].

Hednota hoplitella (Meyrick)

Fig.8D

Crambus hoplitellus Meyrick, 1879, Proc. Linn. Soc. N.S.W. 3: 188.

Talis hoplitellus (Meyrick). Hampson, 1896, Proc. Zool. Soc. Lond. 1895: 969.

Talis hoplitella (Meyrick). Turner, 1904, Proc. Roy. Soc. Qd 18: 172.

Hednota hoplitellus (Meyrick). Bleszynski and Collins, 1962, Acta Zool. Cracov. 7: 315.

Types.—Meyrick described the species from an unspecified number of specimens of both sexes, and gave the type-locality and comments "A very distinct species; abundant in a very restricted locality near Sydney, in March." A series of syntypes (seven males, one female) is in the British Museum (Natural History) (Whalley, personal communication). Following Whalley's selection, I hereby designate as lectotype of *Crambus hoplitellus* Meyrick one of the above specimens, a male labelled "24/3/78 Sydney, N.S.Wales; Meyrick coll."

Diagnosis.—This species can be distinguished by the deep brownish ochreous forewing which is partially suffused with darker brown, and particularly by the central silvery white streak. This streak, which is strongly blackish-margined, commences at base and gradually dilates to beyond middle, where it abruptly bifurcates. Both these branches are short and reach three-fourths disc. The upper branch is slender, and abruptly swollen towards apex beneath. The lower branch is short and pointed. Around the apex of each branch is an irregular cloud of mainly black; from between these clouds proceeds a silvery white, above strongly black-margined, broad streak obliquely upwards to apex (Fig.8D). There is also a straight narrow silvery white subcostal streak, enclosing a narrow fuscous costal streak. Male antennae are strongly bipectinate.

Specimens examined.—11♂, 4♀:

Western Australia: Albany, 11.ii.1926, WBB, 1♂ ANIC; 2.iii.1926, WBB, 1♀ ANIC; 2.iii.1926, WBB, 1♂ QM; 26.iii.1926, WBB, 1♂ ANIC; 26.iii.1926, WBB, 2♂ QM. Kojonup, 7.iv.1963, ALR, 1♂ WAC. Koojan, 3.iv.1962, LEK, 1♀ WAM; 29.iii.1963, LEK, 1♀ WAM. Nedlands, 2.iv.1959, MMHW, 1♀ WAC; 10.iv.1961, MMHW, 1♂ ANIC; 4.iv.1963, MMHW, 1♂ WAC; 9.iv.1964, MMHW, 1♂ WAC; 10.iv.1964, MMHW, 1♂ WAC. Wanneroo, 3.iv.1962, GSMC, 1♂ ANIC.

Hednota relatalis (Walker)

Figs.8E; 10B; 11D,E,F; 12B

Crambus relatalis Walker, 1863, List Lep. Ins. Coll. Brit. Mus. 27: 172, 173.

?*Crambus argyroneurus* Zeller, 1863, Chil. Cramb. Gen. Spec.: 47.

Crambus relatalis Walker. Meyrick, 1897, Proc. Linn. Soc. N.S.W. 3: 191, 192.

Talis relatalis (Walker). Hampson, 1896, Proc. Zool. Soc. Lond. 1895: 969.

Talis relatalis (Walker). Turner, 1904, Proc. Roy. Soc. Qd 18: 173.

Prosmixis radialis Hampson, 1919, Ann. Mag. Nat. Hist. (9) 4: 147.

?*Talis diargyra* Turner, 1925, Trans. Roy. Soc. S. Aust. 49: 42.

Hednota relatalis (Walker). Bleszynski and Collins, 1962, Acta Zool. Cracov. 7: 317.

Types.—Walker described *C. relatalis* from specimens from "a Adelaide. From Mr. Wilson's collection. b. Tasmania. Presented by M. Allport, Eso." Following Whalley's selection, I hereby designate as lectotype of *Crambus relatalis* Walker a male specimen, in the British Museum (Natural History), labelled "*relatalis*, Adelaide, S. Aust. 52/9, Pyralidae, Brit. Mus. Slide No. 7030, ♂". This specimen was labelled by Walker (Whalley, personal communication). The holotype of *C. argyroneurus*, a male, with type-locality Adelaide (additional label data "Mann. Abgeb 857; M. Berol; slide No. 4153 S. Bleszynski"), is in Vienna, according to Bleszynski (Whalley, personal communication). I have not seen the description by Zeller, but Hampson (1896 p.969) regarded *C. argyroneurus* as a synonym of *relatalis*. *P. radialis* was described by Hampson, who gave the type-locality and comments "W. Australia, Waroona (*Berthoud*), 1♂ type. *Exp.* 30mm." The holotype (label data "Waroona, W.A. 14.III.1908 G. F. Berthoud. 1910-194; B.M. Pyralidae Slide No. 7110") is in the British Museum (Natural History) (Whalley, personal communication). The description of *P. radialis* fits *H. relatalis*. I have not seen the holotypes of *C. argyroneurus* or *P. radialis*, and I quote *C. argyroneurus* as synonym following Bleszynski and Collins (1962 p.317). Whalley has compared a slide of mine of male genitalia of *relatalis* with the type genitalia of *P. radialis* (Pyralidae Slide No.7110) and states, personal communication, that they agree exactly and that both the above slides also agree exactly with the genitalia slide (No. 7030) of the *relatalis* lectotype.

T. diargyra is externally very similar to *relatalis* and has been listed as a synonym of it by Bleszynski and Collins (1962). I have examined the holotype of *T. diargyra*, a female, labelled "Swan R. J. S. Clark", in the Australian National Insect Collection; and have dissected its genitalia (Slide No.P250). I here treat *diargyra* as a possible synonym only; more females of *relatalis* need to be examined for variability of genitalia before the status of *diargyra* is ascertained.

Diagnosis.—This species can be distinguished by the gilded forewing which has a silvery white subcostal streak and a silvery white slightly blackish-bordered main discal streak that is divided into three long exterior streaks, which are connected by an almost marginal white streak (Fig.8E). Of the three long exterior streaks, the one nearest to costa is better defined and broader than the other two and separated from the main streak basally; the other two long exterior streaks are close together, nearly parallel, and proceed to termen costal to the tornus. Male antennae are strongly pectinate with much fine hair on teeth (Fig.10B).

Male genitalia (Fig.11D,E,F).—Uncus broad, forming an abrupt point; gnathos dilate, rounded at apex; valva with thick costa and well-developed thorny ampulla; aedeagus wide at apex and with an invagination.

Female genitalia (Fig.12B).—Corpus bursae enlarged, rounded and with rounded sclerotization which has two curved arms; ostium bursae region wide, somewhat sclerotized; slightly bulbous lobes near bases of apophyses anteriores.

Specimens examined.—20 ♂, 6 ♀.

Western Australia: Beverley, 5.iv.1962, P.J.L., 1 ♀ WADA. Denmark, 17.iii.1926, WBB, 1 ♂ QM; 21.iii.1926, WBB, 1 ♀ QM; 22.iii.1926, WBB, 1 ♂ QM. Kojonup, 24.iii.1960, J.D.B., 1 ♂ ANIC; 2.iv.1960, J.D.B., 1 ♂ ANIC; 19.iii.1961, MMHW, 1 ♂ WAM; 17.iii.1961, R.J.P., 1 ♂ ANIC; 22.iii.1961, MMHW, 1 ♂ WAM; 25.iii.1961, MMHW, 1 ♂ WAM; 1.iv.1961, MMHW, 3 ♂ WAM; 20.iii.1962, ALR, 1 ♂ ANIC; 13.iii.1962, ALR, 1 ♀ ANIC; 15.iii.1963, MMHW, 1 ♂ WAM; 23.iii.1963, ALR, 1 ♀ WAC; 30.iii.1963, ALR, 1 ♂ WAC; 17.iii.1964, ALR, 1 ♂ WAC; 19.iii.1964, ALR, 1 ♂ WAC; 20.iii.1964, ALR, 1 ♂ WAC. Koojan, 1961, LEK, 1 ♂ WAM; 6.iv.1962, LEK, 1 ♀ WAM; 28.iii.1963, LEK, 1 ♂ WAM. Swan R., J.S. Clark, 1 ♀ (holotype of *Talis diargyra*) ANIC.

Hednota icelomorpha Turner

No figure available—see comments

Talis icelomorpha Turner, 1905, Proc. Roy. Soc. Qd 19: 65.

Hednota icelomorpha (Turner). Bleszynski and Collins, 1962, Acta Zool. Cracov. 7: 315.

Types.—The type, a female, from Bridgetown (Western Australia), was lodged in the Lyell Collection. The holotype has label data "G. Lyell Coll. Pres. 31-7-32; Bridgetown, Apl. 1905; Type-3592" and is in the National Museum of Victoria (A. Neboiss, personal communication).

Diagnosis.—Unlike the other Western Australian *Hednota*, this species is said to have a forewing with a fine indistinct median whitish streak from base to three-fourths, margined above with fuscous, and a dark fuscous discal dot on lower edge of median streak shortly before end.

Comments.—Turner states that *icelomorpha* is near *H. acantophora* [which does not occur in W.A.] but "frons with a longer cone, forewings with termen not sinuate, central streak not prolonged to termen or apex, cilia without darker line". Unfortunately, I have been unable to see the holotype of *icelomorpha*. I have not seen a single specimen fitting the description of *icelomorpha* among the collections examined and among the Western Australian light trap material. But I have examined many specimens of *H. acantophora* (Meyrick) from the Eastern States.

Hednota cotylophora (Turner)

Fig.9A

Talis cotylophora Turner, 1942, Proc. Roy. Soc. Qd 53: 83.

Hednota cotylophora (Turner). Bleszynski and Collins, 1962, Acta Zool. Cracov. 7: 314.

Types.—When describing the species, Turner said that he received, from Mr. W. B. Barnard, six specimens collected in March and April at Denmark (Western Australia). The holotype (T.6341) a male, is in the Queensland Museum and has label data "Denmark, W.A., 3-4-26, W. B. Barnard" (J. T. Woods, personal communication).

Diagnosis.—Forewing brownish grey; with a slender white curved median line from one-third to two-thirds, its concavity on costal side filled with fuscous; a fuscous costal streak from base to three-fifths; a very slender white sub-terminal line inwardly oblique from costa before apex, soon curved outwards and sinuate to tornus; white apical spot preceded by a fuscous costal spot; and blackish spots, usually three, on termen towards tornus (Fig. 9A).

Specimens examined.—6 ♂, 1 ♀.

Western Australia: Denmark, 16.iii.1926, WBB, 1 ♂ ANIC; 22.iii.1926, WBB, 3 ♂ QM; 28.iii.1926, WBB, 1 ♂ ANIC; 2.iv.1926, WBB, 1 ♀ ANIC; 3.iv.1926, WBB, 1 ♂ ANIC.

Comments.—At a glance, this species looks like a rubbed *H. dichospila*. But it is a distinct species; e.g. the male antennae are not bipectinate as in *H. dichospila* but are pectinate and have wider and much stronger teeth with the apices of the teeth densely hairy. On forewing-markings *H. cotylophora* can be distinguished from *H. dichospila* by the lack of the transverse mark in disc at one-third; in that the slender white curved median line (its concavity on costal side filled with fuscous) extends further towards base than the corresponding one in *H. dichospila* and is not as curved upwards towards apex; and by the lack of the pair of distinct white spots on termen above tornus.

Hednota ancylosticha, sp. nov.

Figs.9B; 11G,H,I; 12C

Types.—The holotype is an adult male with wing expanse 23.9 mm (Fig. 9B) and label data "Nedlands, W.A., Light Trap, 21 Mar. 1961, M. M. H. Wallace" (Genitalia Slide No. P248), in the Australian National Insect Collection. Forty-four paratypes; for details see specimens examined.

Description.—Head whitish. Labial palpi twice as long as head, whitish on dorsal aspect, dark fuscous on sides, ventral aspect whitish mixed with dark fuscous. Antennae whitish ochreous, in both male and female very much as in *H. longipalpella*. Thorax fuscous ochreous. Abdomen whitish. Legs ochreous white. Forewing elongate, rather dilate, costa straight, termen subdentate, slightly rounded; ochreous, fuscous, and suffused with white centrally and towards dorsum; whitest on disc, which irregularly has much ochreous and some fuscous; towards base the colour becomes more ochreous and white, and there is a short distinct white median streak from base; a violet-silvery transverse metallic line which has a portion missing

in the middle (which is white), sharply angulate above and below middle, upper angulation much fainter than the one below; a somewhat rounded violet-silvery metallic mark at about two-thirds disc, convex towards base and strongly margined on internal (convex) side with black; behind this is an irregular sprinkling of fuscous; then corresponding to the silvery metallic outwardly-curved subterminal line of *H. longipalpella* there is a curved series of six separate silvery metallic patches which are rounded towards base but towards termen merge into six elongate rod-like patches of fuscous; the silvery metallic patches are margined with fuscous internally, and the patch closest to costa merges into an inwardly curved white subterminal line reaching costa; costal region near apex dark fuscous; termen with seven black spots on extremities of veins, the spot second closest to dorsum is elongated towards base; cilia silvery metallic fuscous grey with a whitish line at base and in middle. Hindwing pale fuscous grey; cilia white with a fuscous grey parting-line.

Male genitalia (Fig.11G,H,I).—Uncus elongated towards rounded apex; gnathos arms meeting abruptly; anellar arms shortish, curved outwardly and tapering to a fine point; anellus with a point towards gnathos; valva with costa nearly straight, then downcurved at apex to form a point, apex then has inward arch which proceeds outwards to form a second more-rounded point of apex, dorsum slightly wavy; aedoeagus large, curved, with concave aspect on side of ductus ejaculatorius; cornutus as two, pointed horns differing in size, both united at base.

Female genitalia (Fig.12C).—Corpus bursae elongate, irregularly shaped at bottom; somewhat sclerotized exteriorly at ductus bursae; ostium bursae region sclerotized, broader than deep, slightly pointed towards corpus bursae.

Expanse.—Male 21.0-25.2 mm, female 21.7-27.8 mm.

Specimens examined.—18♂, 27♀.

Western Australia: Nedlands, 21.iii.1961, MMHW, 1♂ (holotype of *Hednota ancylosticha*, sp. nov.) ANIC. And the following paratypes—Albany, 21.ii.1926, WBB, 3♀ QM; 2.iii.1926, WBB, 1♂ 1♀ QM; 3.iii.1926, WBB, 1♀ ANIC; 8.iii.1926, WBB, 1♂ QM; 10.iii.1926, WBB, 1♂ QM; 15.iii.1926, WBB, 1♂ QM. Denmark, 9.iii.1926, WBB, 1♂ ANIC; 14.iii.1926, WBB, 1♂ ANIC; 17.iii.1926, WBB, 2♀ ANIC. Kojonup, 15.iii.1961, MMHW, 1♀ WAM; 15.iii.1963, MMHW, 1♀ WAM; 15.iii.1963, MMHW, 1♀ WAM; 21.iii.1963, ALR, 1♂ 7♀ WAC. Nedlands, 29.iii.1959, MMHW, 1♀ WAC; 17.iii.1961, MMHW, 1♂ 1♀ ANIC; 27.iii.1961, MMHW, 1♂ ANIC; 10.iv.1961, MMHW, 1♀ ANIC; 18.iii.1963, MMHW, 2♀ WAC; 25.iii.1963, MMHW, 1♂ 1♀ WAC; 26.iii.1963, MMHW, 1♂ WAC; 27.iii.1963, MMHW, 1♂ WAC; 28.iii.1963, MMHW, 2♂ 1♀ WAC; 31.iii.1963, MMHW, 2♂ 1♀ WAC. Perth, Mathews, 1♀ ANIC. Roleystone, 3.iv.1962, LEK, 1♀ WAM.

Comments.—Several specimens of this species stood in the collections above Turner's unpublished name '*ancylosticha*', which I quicken for this species. The species is very close to *H. longipalpella* in wing markings, antennae, and genitalia of both sexes. Its forewing can be distinguished from that of *H. longipalpella* in that the middle portion of the violet-silvery metallic line is missing, and this line is more strongly angulate above and below middle than in *H. longipalpella*; also by the somewhat

rounded violet-silvery metallic mark at about two-thirds disc, unlike the corresponding mark in *H. longipalpella* which is distinctly crescentic; and by the curved row of six prominent fuscous rod-like patches which are capped with silvery metallic patches placed as a broken subterminal line. Unlike *H. longipalpella*, it has no distinct ochreous white rings at the apices of the tarsal joints. In the male genitalia, the anellar arms and the anellus are different from those of *H. longipalpella*; and in the female genitalia, the lack of the elongate bottom of the corpus bursae and the lack of the elongate curved ribs along the length of the corpus bursae help to distinguish the species from *H. longipalpella*.

I have seen two specimens of this species from Blackwood, South Australia. Both were males with no further data, in the South Australian Museum. This is the only one of the new species, described in this paper, of which I have seen specimens taken from outside Western Australia.

Hednota koojanensis, sp. nov.

Figs.9C; 10C; 11J,K,L; 12D

Types.—The holotype is an adult male with wing expanse 21.4 mm (Fig. 9C) and label data "L. E. Koch, 24.iii.1961, Koojon, W. Aust., W.A.M. No. 63-441" (Genitalia Slide No. W.A.M. 63-441a), in the Western Australian Museum. Twenty-two paratypes; for details see specimen examined.

Description.—Head whitish ochreous. Labial palpi twice as long as head and ochreous fuscous, whitish ventrally except at apex, white ventrally behind eyes. Antennae whitish ochreous, male antennae with wide closely-set teeth (Fig. 10C). Thorax whitish ochreous. Abdomen whitish. Legs whitish grey, anterior pair fuscous whitish. Forewing narrowly triangular, apex acute, termen slightly sinuate, scarcely oblique; ochreous fuscous, partly suffused with white and suffused with some fuscous; a white subcostal streak from base to near apex, its costal edge pale ochreous fuscous; below this a wider ochreous dark fuscous streak diverging towards apex and termen, a still wider diverging white streak along length of wing, diverging to termen, sprinkled with some fuscous towards termen; rest of wing towards dorsum ochreous fuscous and with some fuscous spots towards termen; a pale ochreous subterminal line, separated by a narrow white streak from a pale ochreous submarginal line; a white terminal streak containing some triangular blackish dots more defined at tornus; cilia white. Hindwing whitish, termen slightly sinuate; cilia whitish.

Male genitalia (Fig.11J, K,L).—Uncus and gnathos both gradually tapering to rounded apex; gnathos sharply curved towards uncus internally at apex; anellar arms short and gradually tapering to a fine point; valva long and narrow, costa nearly straight, dorsum somewhat wavy; aedoeagus dilated and rounded at apex.

Female genitalia (Fig.12D).—Corpus bursae elongate, rounded at bottom; ductus bursae strongly sclerotized; apophyses long.

Expanse.—Male 19.4–23.8 mm, female 18.9–22.4 mm.

Specimens examined.—20 ♂, 3 ♀

Western Australia: Koojan, 24.iii.1961, 63–441, LEK, 1♂ (holotype of *Hednota koojanensis*, sp. nov.) WAM. And the following paratypes—Koonup, 7.iii.1962, RJP, 1♀ ANIC; 16.iii.1962, MMHW, 1♂ WAM. Koojan, 22.iii.1961, LEK, 1♂ WAM; 24.iii.1961, LEK, 13♂ WAM; 24.iii.1961, LEK, 1♀ WAM; 26.iii.1961, LEK, 2♂ WAM; 1961, LEK, 2♂ WAM. Nedlands, 12.iv.1962, MMHW, 1♀ ANIC.

Comments.—On appearance of forewing this species is very close to *H. peripeuces*, but differs in having the wide ochreous dark fuscous streak diverging towards apex and termen, and the still wider white streak along length of wing and diverging to termen; also differs in the absence of the dark fuscous line at the base of the subcostal white streak from base to near apex; and, as a rule, in the absence of the distinct blackish dot in disc at two-thirds. The male antennae differ from those of *H. peripeuces* in that the teeth are wider, shorter and more closely-set (Figs. 10A and C). In the male genitalia, the differently shaped uncus, gnathos, anellar arms, and valvae distinguish *H. koojanensis* from *H. peripeuces*. In the female genitalia, *H. koojanensis* can be distinguished from *H. peripeuces* by the longer apophyses and the snailer and less complicated sclerotization in the ductus bursae region. The species has been found mostly at Koojan, W.A.

Hednota tenuilineata, sp. nov.

Fig.9D

Types.—The holotype is an adult male with wing expanse 20.3 mm (Fig. 9D) and label data "Koonup, West. Aust., 28.III.60, J. D. Beresford", in the Australian National Insect Collection. Six paratypes; for details see specimens examined.

Description.—Head ochreous fuscous with a white line over each eye. Labial palpi twice as long as head, fuscous, whitish ventrally except at apex. Antennae dark fuscous, the male strongly bipectinate. Thorax ochreous fuscous. Abdomen pale ochreous fuscous. Legs pale ochreous fuscous, anterior pair more fuscous. Forewing moderately broad, termen almost straight; deep ochreous fuscous; a straight narrow silvery white subcostal streak proceeding from costa near base and ending on costa shortly before apex after curving upwards to meet it from about two-thirds of distance, enclosing a narrow deep ochreous fuscous streak; a silvery white, strongly fuscous-margined, central streak from base abruptly bifurcate beyond middle, both branches short, reaching to three-fourths disc; upper branch same width as before branching, bluntly pointed towards apex; lower branch same length as upper and gradually tapering to a point; from near point of lower branch proceeds a silvery white, above strongly black-margined, broad streak obliquely upwards to apex, sharp-pointed above, sending from its lower edge, which is slightly towards apex from point of lower branch, a distinct silvery white tapering streak sharply curved at a right angle pointing towards tornus and ending abruptly before tornus; apex of wing suffused with dark fuscous; three or four

faint dark fuscous dots on hindmargin towards tornus; an indistinct line of dark fuscous along inner margin; a distinct, thin, white submarginal line along termen with a thin dark fuscous line along it exteriorly; cilia silvery metallic grey. Hindwing whitish grey, suffusedly darker grey along termen; cilia whitish with a fuscous grey parting-line.

Expanse.—Male 19.2–20.3 mm, female 19.8 mm.

Specimens examined.—5 ♂, 2 ♀.

Western Australia: Koonup, 28.iii.1960, JDB, 1♂ (holotype of *Hednota tenuilineata*, sp. nov.) ANIC. And the following paratypes—Koonup, 31.iii.1960, JDB, 1♀ ANIC; 17.iii.1961, RJP, 1♂ ANIC; 24.iii.1961, MMHW, 1♂ WAM; 16.iii.1963, ALR, 1♂ WAC; 5.iv.1963, ALR, 1♂ WAC. Nedlands, 13.iv.1964, MMHW, 1♀ WAC.

Comments.—Very close to *H. hoplitella* on forewing-markings, but distinguished from it by the lack of the clouds of black scales at the apices of the two branches; in that the oblique streak to apex is from near point of lower branch and is sharply curved at a right angle and pointing towards tornus; and in that all silvery white streaks are markedly thinner than those in *H. hoplitella*. The male antennae are like those of *H. empheres*, sp. nov. (Fig.10D).

Hednota odontoides, sp. nov.

Fig.9E

Types.—The holotype is an adult female with wing expanse 22.2 mm (Fig. 9E) and label data "Light Trap, Nedlands, 28.ii.61, M. M. H. Wallace", in the Australian National Insect Collection. Two paratypes; for details see specimens examined.

Description.—Head fuscous ochreous with a whitish line over each eye. Label palpi twice as long as head, fuscous, whitish internally and ventrally except at apex. Antennae dark fuscous, the male strongly pectinate with thick teeth. Thorax ochreous fuscous. Abdomen whitish. Legs fuscous whitish, anterior pair darker fuscous. Forewing moderately broad, termen slightly rounded; deep brownish ochreous, partly suffused with darker fuscous; a straight narrow silvery white subcostal streak, proceeding from costa near base, ending on costa again shortly before apex, and enclosing a narrow fuscous costal streak; a silvery white, faintly dark fuscous-margined, central streak from base, gradually dilating to near middle where it abruptly bifurcates, the upper branch short with upper edge straight and lower edge abruptly turning upwards to meet it forming a tooth-like point, lower branch thin for about length of upper branch and then forming a broad silvery white centrally dilated streak sloping obliquely towards apex and ending in a blunt point before apex in line with end of upper branch and costal edge of central streak; parallel to this sloping streak is a faintly dark fuscous-margined thin silvery white streak meeting termen before apex; an indistinct silvery white streak about as broad as subcostal streak along length of dorsum from base, enclosing a fuscous ochreous streak along dorsum; this silvery white streak ends indistinctly before meeting the thin silvery white streak that meets the termen; apex of wing suffused with dark fuscous; an irregular line of indistinct fuscous along termen; cilia silvery metallic grey with an

irregular darker grey line towards base. Hindwing whitish grey, suffusedly darker fuscous grey at apex; cilia whitish with a fuscous grey parting-line.

Expanse.—Male 24.2 mm, female 22.2-23.6 mm.

Specimens examined.—1 ♂, 2 ♀.

Western Australia: Nedlands, 28.ii.1961, MMHW, 1 ♀ (holotype of *Hednota odontoides*, sp. nov.) ANIC. And the following paratypes—Nedlands, 24.iii.1962, MMHW, 1 ♀ ANIC; 18.iii.1963, MMHW, 1 ♂ WAC.

Comments.—On the forewing-markings close to *H. hoplitella* and *H. tenuilineata*, but markedly distinguishable from them by the central streak having its upper branch tooth-like and its lower branch abruptly turned upwards forming a broad white centrally-dilated streak which slopes obliquely towards apex and ends in a blunt point before apex; and also by the silvery white streak near dorsum, and the silvery white streak meeting termen before apex. The male antennae are pectinate, unlike the strongly bipectinate antennae of *H. tenuilineata* and *H. empheres*, sp. nov.

***Hednota empheres*, sp. nov.**

Figs.9F; 10D; 11M,N,O; 12E

Types.—The holotype is an adult male with wing expanse 23.1 mm (Fig.9F) and label data "Nedlands, W.A., Light Trap, 11 Apr. 1961, M. M. H. Wallace" (Genitalia Slide No. P249), in the Australian National Insect Collection. Six paratypes; for details see specimens examined.

Description.—Head ochreous with a white line over each eye. Labial palpi twice as long as head, dark fuscous, whitish internally and ventrally except at apex. Antennae dark fuscous; the male strongly bipectinate, apices of teeth dilate and upturned and with long hair (Fig.10D). Thorax fuscous ochreous. Abdomen whitish, slightly gilded. Legs whitish, anterior pair fuscous whitish. Forewing moderately broad, termen almost straight; ochreous, suffused with some fuscous, slightly gilded towards dorsum; a straight narrow silvery white subcostal streak, proceeding from costa near base, and ending on costa shortly before apex, enclosing a narrow ochreous streak suffused with some fuscous towards costal margin; a silvery white faintly dark fuscous-margined, central streak from base to disc, where it breaks up into three exterior streaks; the more costal of these streaks is better-defined and broader than the other two, dilated centrally, margined with fuscous, and separated from the main streak towards the base; the other two streaks are close together, nearly parallel, and proceed to termen costally to tornus; of these two streaks the one closer to the dorsum is less distinct than the other one; dorsum suffused with white from margin; a distinct broad silvery white submarginal streak with a strong dark fuscous-margined line externally; cilia greyish white with a pale fuscous parting-line. Hindwing slightly gilded, whitish grey; cilia whitish with a fuscous grey parting-line.

Male genitalia (Fig.11M,N,O).—Uncus narrowly tapering to rounded apex; gnathos abruptly tapering to rounded narrow apex; valva at apex narrow rounded and upturned, ampulla as a well-developed thin folded funnel; aedeagus roughly dilate at apex and with an invagination.

Female genitalia (Fig.12E).—Corpus bursae irregularly rounded, some rounded internal sclerotization; ductus bursae long and narrow; bulbular sclerotization in ostium bursae region; bulbous lobes near bases of apophyses anteriores.

Expanse.—Male 23.1-24.2 mm, female 18.3-21.1 mm.

Specimens examined.—3 ♂, 4 ♀.

Western Australia: Nedlands, 11.iv.1961, MMHW, 1 ♂ (holotype of *Hednota empheres*, sp. nov.) ANIC. And the following paratypes—Koojan, 22.iii.1961, LEK, 2 ♀ WAM; 24.iii.1961, LEK, 1 ♂ WAM; 1961, LEK, 1 ♀ WAM; 14.iv.1962, LEK, 1 ♀ WAM. Nedlands, 11.iv.1961, MMHW, 1 ♂ ANIC.

Comments.—On forewing-markings closely resembling *H. relatalis*. But distinguishable by the exterior streaks being shorter and broader than in *H. relatalis*, and by the strong and broad submarginal silvery white streak, which in *H. relatalis* is narrower and only strong in apical half. Also the insect is not as strongly gilded as *H. relatalis*. The antennae of male *H. empheres* (Fig.10D), which are like those of *H. tenuilineata* but unlike those of *H. relatalis* (Fig.10B), can be distinguished from those of *H. panteucha* (Fig.5A) by the apices of the teeth being more upturned, dilate, and more hairy. The male genitalia of *H. empheres* and *H. relatalis* can be immediately distinguished by the ampullae, which have a funnel-shaped structure in the former and are thorny in the latter. In the female genitalia, the bulbous lobes near the apophyses anteriores are better developed

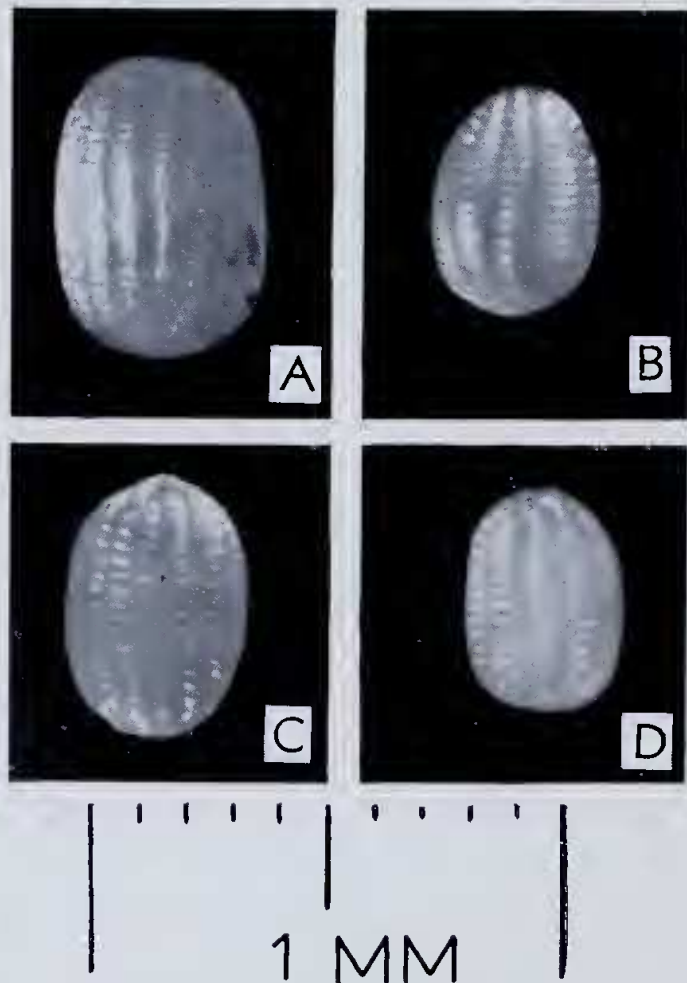


Figure 13.—The egg of: A, *H. panteucha*; B, *H. longipella*; C, *H. pedionoma*; D, *H. crypsichroa*.

in *H. empheres* than in *H. relatalis*; and *H. empheres* lacks the rounded sclerotization of the corpus bursae and the two curved arms which are present in *H. relatalis*.

Both *H. relatalis* and *H. empheres* have a faint, very narrow suggestion of a silvery white line, from central streak, commencing at one-third to half distance from base and proceeding towards tornus.

Immature stages of the four webworm species

The surfaces of the eggs of *H. panteucha*, *H. longipalpella*, *H. pedionoma* and *H. crypsichroa* have prominent longitudinal ribs and less prominent but more numerous transverse ribs giving the eggs a cross-hatched appearance. Photographs of the eggs of all four species are shown as Figure 13. The eggs are whitish when laid; and fertile eggs change colour after about half their developmental period has elapsed.

Table 2

Characteristics used to differentiate the immature stages of the four webworm species

Stage	Characteristic	Species			
		<i>H. panteucha</i>	<i>H. longipalpella</i>	<i>H. pedionoma</i>	<i>H. crypsichroa</i>
Egg (Fig. 13)	Size	Mean length 0.68 mm. and diameter 0.47 mm. Larger (highly significant: $P < 0.001$) than three species	Not significantly ($P > 0.05$) different from each other; e.g., <i>H. longipalpella</i> had mean length 0.50 mm. and diameter 0.32 mm. [35 eggs of each of the four species were measured for these statistics, and the S.E. of the mean for length and diameter for each species was ± 0.01].		
	Colour during development	Orangish yellow	Bright red	Not red	Not bright red
	Transverse ribs	Not as pronounced or widely spaced as in <i>H. crypsichroa</i>			Very pronounced and widely spaced (even more evident than in Fig. 13D)
Larva	Mandible (Fig. 14)	No dorsal teeth, dorsal part of biting edge smooth and rounded	First two teeth prominent, dorsal teeth less well defined with teeth three and four tending to coalesce	Four well defined teeth, second one large. Dorsal edge rounded	Dorsal teeth ill-defined. Wide mandible with dorsal edge at a right angle to biting edge
	Fronto-clypeal "beak"	Prominent			Not prominent
Pupa	Cremaster (Fig. 15)	Tri-lobed	Terminal two cremastral setae long, widely separated from each other	Terminal cremastral setae short, widely separated from each other	Terminal two cremastral setae short, narrowly separated from each other

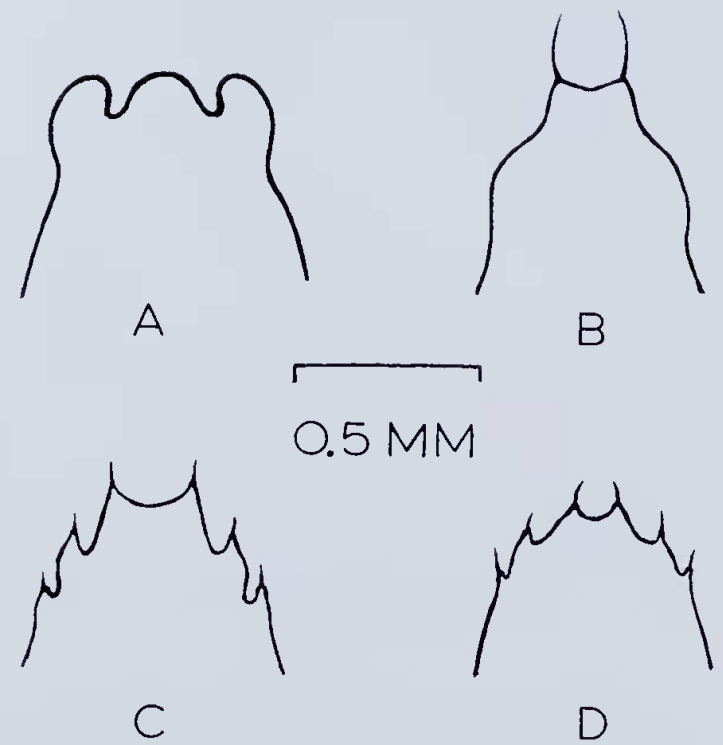
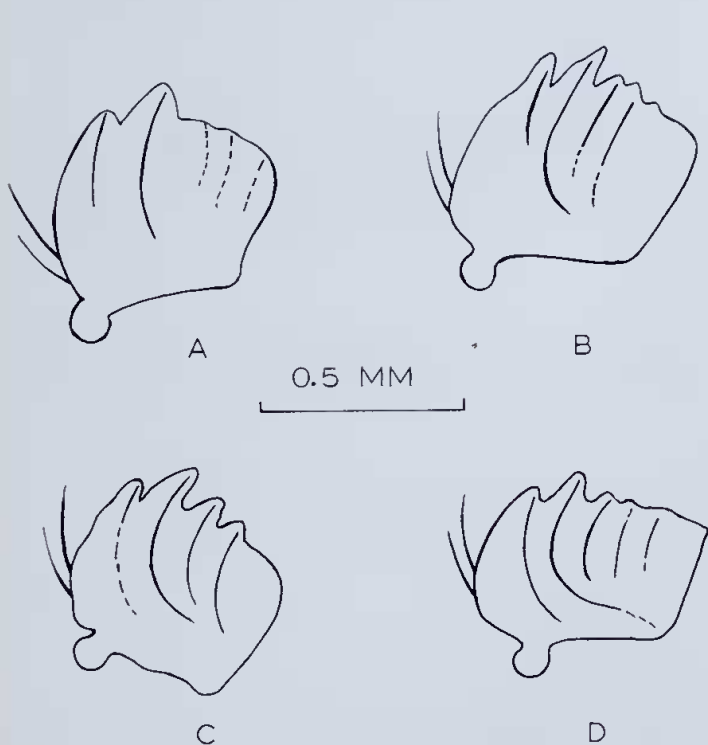


Figure 14.—Mesal view of right larval mandible of: A, *H. panteucha*; B, *H. longipalpella*; C, *H. pedionoma*; D, *H. crypsichroa*.

Figure 15.—Outline of ventral view of cremastral region of pupa of: A, *H. panteucha*; B, *H. longipalpella*; C, *H. pedionoma*; D, *H. crypsichroa*.

Larvae of the four species, although superficially alike, differ in details of body colouration and setal arrangement. However, specimens bred through their life cycles, and identified at the adult stage, revealed that the simplest method of distinguishing the late instar larvae, including aestivating larvae, of the four species was by the appearance of the biting edge of the mandible. In *H. panteucha*, the first two teeth, i.e. the most ventral ones, are large and wide with the second one noticeably longer than the first; the rest of the biting edge is smooth because the other teeth are extremely small. In *H. longipalpella*, the first two teeth are longer and more pointed, and the next two teeth tend to coalesce and they are followed (dorsally) by another small tooth. In

H. pedionoma, the first four teeth are well-defined and deeply indented with the second tooth long, and the third slightly indented along its dorsal edge. In *H. crypsichroa*, the mandible is wide with the dorsal teeth ill-defined and the dorsal edge at about a right angle to the biting edge and not rounded where these edges meet. Mandibles of the four species are illustrated in Figure 14.

The pupae of *H. longipalpella*, *H. pedionoma* and *H. crypsichroa* fall within the range of size and colour of pupae of *H. panteucha*, but they do not have its pronounced fronto-clypeal "beak". I found that each species has a different cremaster (Fig.15).

The characteristics which I employed to distinguish the four species during their immature stages are given in Table 2.

Immature stages of *H. panteucha*

Because the four webworm species could be distinguished during all stages in the life cycle, I was able to establish that only one of the species, *H. panteucha* (except for one small patch, of about 2 yds. sq. during 1962 to 1963, of only *H. longipalpella*), lived in a paddock of barley grass at Koojcn. Thus it was possible for me to make a detailed biological and ecological study of *H. panteucha* in the paddock. Relative to *H. panteucha*, few moths of *H. pedionoma* and *H. crypsichroa* were observed there; extremely few of these were females and no oviposition by these two species was seen in the paddock. The larval and pupal stages of *H. pedionoma* and *H. crypsichroa* were not found there during three years of observation. All moths bred from the area, except for the few *H. longipalpella* from the one small patch, were *H. panteucha*.

The outline and a portion of the surface appearance of the egg of *H. panteucha* are shown in Figure 16.

First instar larvae of *H. panteucha* and *H. longipalpella* are shown in outline in Figure 17. I differentiated first and later instar feeding larvae of these two species by the characteristics show in Table 3.

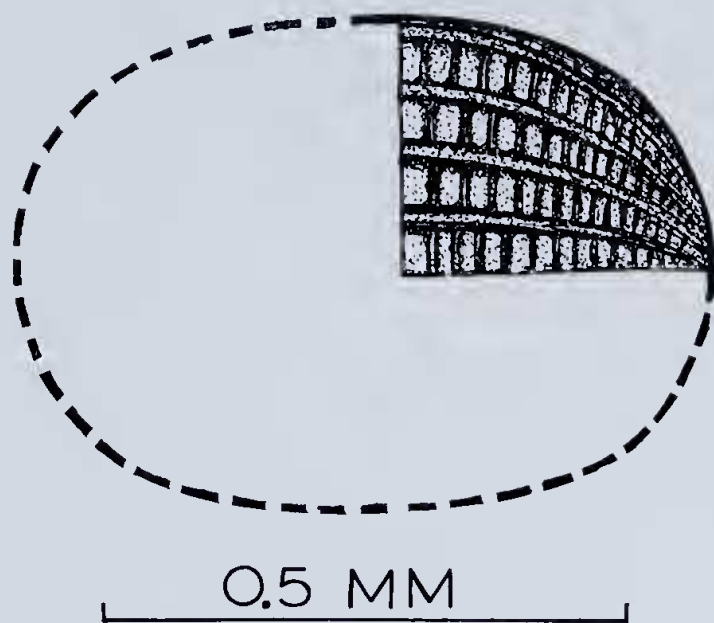


Figure 16.—Outline of egg of *H. panteucha* and portion showing appearance of surface.

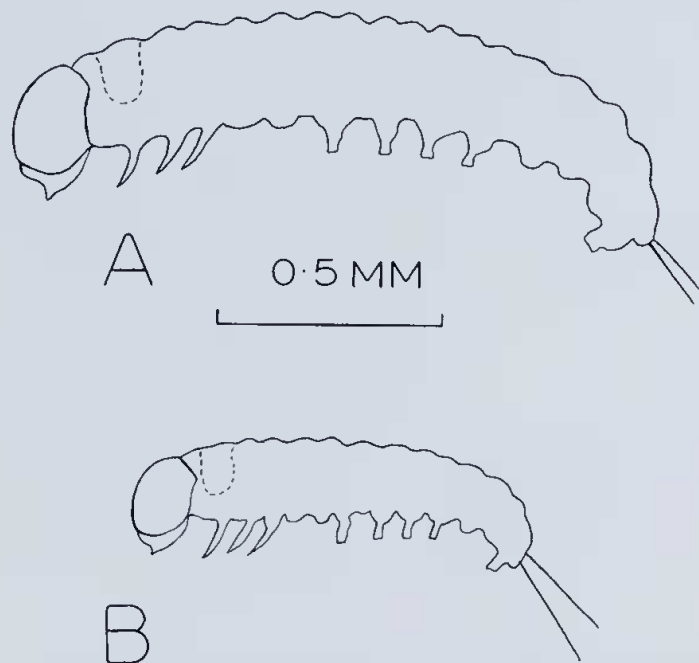


Figure 17.—Outline of first instar larva of: A, *H. panteucha*; B, *H. longipalpella*. Two setae on the tenth abdominal segment of each species indicate the difference in setal length relative to body length in the two species. (Dotted lines indicate prothoracic shields.)

Table 3

Characteristics used to differentiate the feeding larvae of *H. panteucha* and *H. longipalpella*

Stage	Characteristic	Species	
		<i>H. panteucha</i>	<i>H. longipalpella</i>
First instars (Fig. 17)	Body colour	Not red	Distinctly red
	Head size	Larger	Smaller
	Length of body setae	Shorter	Longer
Later feeding instars	Body pigmentation	Not reddish	Reddish
	Head colour	Lighter	Darker

Description of Final Instar Larva of *H. panteucha*.—Body length 18 mm, width 2.5 mm. Head width 1.8 mm. Head yellowish brown with dark brown markings. The part of frontoclypeal apotome enclosed by the adfrontal sutures extends more than two-thirds of the distance to the vertical triangle. Two pale yellow bands dorsal of adfrontal sutures form an inverted V. Ocelli 3 and 4 smaller and closer together than other ocelli. The first two (ventral) teeth of the biting edge of the mandible are well defined; i.e., long and wide, particularly the second one. Other more dorsal teeth are practically non-existent, giving that part of the biting edge a smooth appearance ending dorsally in a distinct curve. The mesal view of the right mandible is shown in Figure 12A. Body cream to light brown with yellow to brown pigmented areas. (Feeding larvae appear greenish because of grass in the alimentary canal.) The prothoracic shield is darker than the other pigmented areas of the body. Crochets of abdominal prolegs arranged in complete circles; mainly biordinal, but partly triordinal. Spiracle of eighth abdominal segment of the same size as prothoracic spiracle; spiracle on seventh abdominal segment about half the size of that on the eighth abdominal segment; each of the other abdominal spiracles about half the size of that on the seventh abdominal segment. The general appearance of the larvae showing the pigmented areas and the setal arrangement is presented in Figure 18.

Number of Instars.—Under ideal conditions with adequate food, *H. panteucha* completed six larval instars. In laboratory experiments, larvae in which growth was prolonged by lack

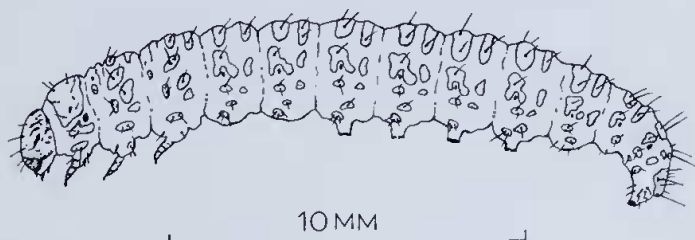


Figure 18.—Final instar larva of *H. panteucha*.

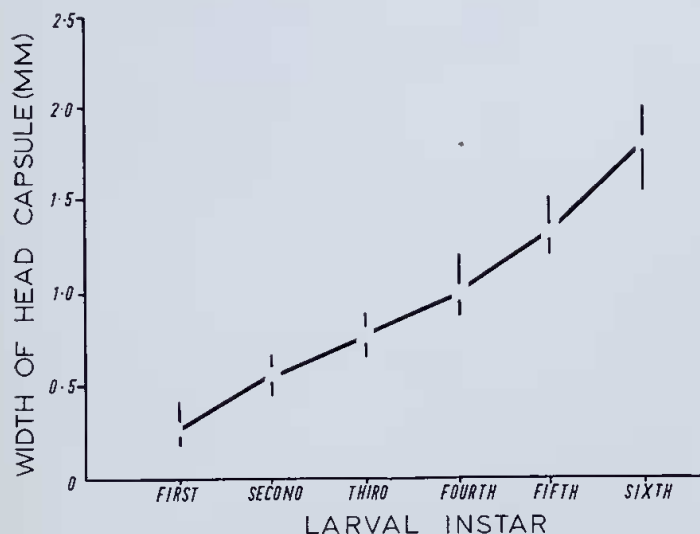


Figure 19.—Mean width of head capsule of each larval instar of *H. panteucha*. The vertical lines indicate the range of size within each instar.

of food and low temperature, completed seven or eight instars. However, six instars was the usual number in the field. And this was determined for the area of detailed study by measuring the head capsules of several hundred larvae of *H. panteucha*, covering the whole range of head capsule size, and by making histograms of the frequencies of head capsule widths. At least fifty specimens of each instar were measured. Figure 19 shows the mean widths of the head capsules of the six larval instars, and the range of size within each instar. *H. longipalpella* in the area also had six instars.

Pupae of *H. panteucha* (Fig. 20) had the following dimensions: mean length 12.5 mm (range 9.0-14.0 mm), mean width 2.3 mm (range 2.0-3.0 mm). They are creamy yellow at first, soon turn honey-brown and remain so for most of their development, and then darken shortly before moth emergence.

Acknowledgments

This investigation was carried out with the aid of a Research Grant received in 1961 from the Reserve Bank of Australia (Rural Credits Development Fund).

I wish to express gratitude to Dr. E. P. Hodgkin, Reader in Entomology and Comparative Anatomy, and to Dr. A. R. Main, Reader, both of the Zoology Department, University of Western Australia for encouragement and advice throughout the project.

I am grateful to Mr. I. F. B. Common, Senior Principal Research Scientist, Division of Entomology, C.S.I.R.O., Canberra, A.C.T., for constructive criticism of the manuscript. For useful comments I thank Dr. S. Bleszynski, Keeper of the Entomology Department, Zaklad Zoologii Systematycznej, Polska Akademia Nauk, Krakow, Poland.

For the loan of specimens, I am indebted to Dr. K. H. L. Key and Mr. I. F. B. Common, Division of Entomology, C.S.I.R.O., Canberra; the late Mr. G. Mack, and Mr. J. T. Woods and Mr. E. C. Dahms, Queensland Museum, Brisbane; Dr. J. W. Evans and Mr. C. N. Smithers, Aus-

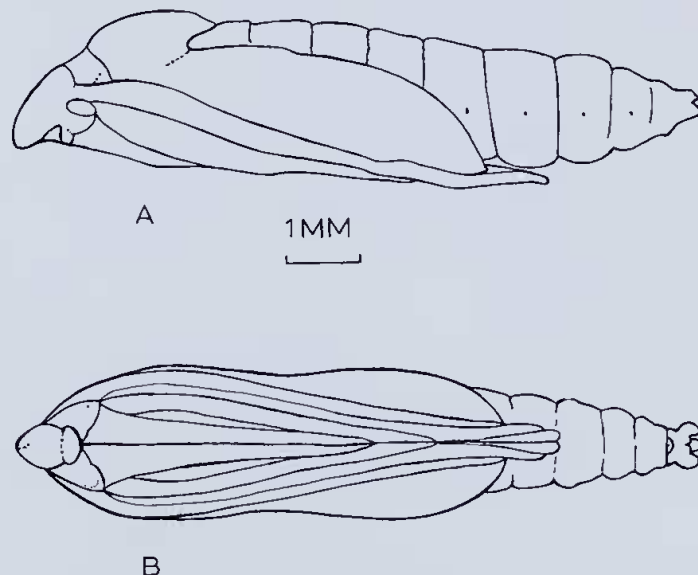


Figure 20.—Pupa of *H. panteucha*: A, lateral view; B, ventral view.

tralian Museum, Sydney; Mr. J. McNally and Mr. A. N. Burns, National Museum of Victoria, Melbourne; Dr. W. P. Crowcroft and Mr. G. F. Gross, South Australian Museum, Adelaide; Dr. A. R. Brimblecombe, Queensland Department of Agriculture and Stock, Brisbane; Mr. F. M. Read, Victorian Department of Agriculture, Melbourne; Mr. P. R. Birks, South Australian Department of Agriculture, Adelaide; Mr. C. F. H. Jenkins, Western Australian Department of Agriculture, South Perth; Miss Helen M. Brookes, Waite Agricultural Research Institute, Adelaide; and Mr. M. M. H. Wallace, Western Australian Regional Laboratory, C.S.I.R.O., Nedlands.

I thank the Trustees of the British Museum (Natural History) for information, on their specimens, received through Mr. P. E. S. Whalley, their Senior Scientific Officer, whom I especially thank.

Thanks are due to Mrs. Rosemary Herbert, Artist, Western Australian Museum, for lettering the figures; to Mr. M. M. H. Wallace, Principal Research Scientist, Western Australian Regional Laboratory, C.S.I.R.O., Nedlands, for the photograph (Fig.1) and for presenting light trap material; and to Mr. T. E. Walshe, Photographer, Zoology Department, University of Western Australia, for taking the photographs in Figures 4, 8, 9, and 13.

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